THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

[REGISTERED AS A NEWSPAPER.]

VOL. XXV. No. 615.] LONDON, FEBRUARY 23, 1875. [27TH YEAR.] Price 6d.

RAMSAY'S NEWCASTLE CANNEL
COAL. Analysis—10,000 cubic feet of gas per ton of coal; 26-candle gas; 13¼ cwt. coke per ton of coal.
The London Exhibition in 1851 was lighted with gas made from Ramsay's Cannel.
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GAS-RETORTS, introduced 1828. FIRE-BRICK WORKS, established 1804. FIRE-CLAY SANITARY PIPES, CHIMNEY-TOPS, and all Goods made of Fire-Clay. The Fire-Clay is worked from Blaydon Main Colliery, is of excellent quality, and no expense spared in perfecting every article. The FIRE-BRICKS (marked "RAMSAY") are to be seen in all parts of the world, and the Works are the most extensive in the Kingdom.
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These Paints are now used in 100 Country Gas-Works, and by all (but one) of the London Gas Companies, on Gasholders, Scrubbers, Purifiers, &c. They will cover tar effectually. Also used by the Admiralty, War Office, Railway Companies, Founders, &c.
They prevent and arrest rust, and protect iron from the action of water, sulphurous and gaseous exhalations.
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J. R. and Co. make all kinds of Tubes and Fitting for Gas, Steam, and Water; Gun-Metal Cocks, Stocks, and Dies; Galvanized Tubes and High-Pressure Tubes, &c.
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RETORTS SET, AND GUARANTEED TO BURN OFF A CERTAIN AMOUNT OF COAL, OR ELSE NO MONEY TAKEN FOR THE CONTRACT.
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Warranted to Measure correctly, and not to vary.
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WROUGHT-IRON TUBES AND FITTINGS

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Boiler-Tube Ferrules, Gun-Metal Gland Cocks, Water-Gauges, Whistles, &c.; Stocks, Taps, and Dies for Screwing, and Gas-Fitters Tools.

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The only Prize Medal awarded for TUBES & FITTINGS.

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IMPROVED WROUGHT-IRON RETORT-LIDS, CROSS-BARS, & SCREWS;

AND GAS APPARATUS OF EVERY DESCRIPTION.

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By use of which Man-lid, inlet and outlet pipes can be examined and cleansed without loss of gas in crown of holder, or ingress of atmospheric air.

ROOFS, GIRDERS, BRIDGES, AND BOILERS OF ALL KINDS.

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FOR GAS, STEAM, AND WATER;

Also ORDINARY WELDED WROUGHT-IRON TUBES and FITTINGS,

FOR GAS, STEAM, & WATER, EITHER BLACK, GALVANIZED, OR ENAMELLED.

CORE BARS FOR IRONFOUNDERS, STOCKS, TAPS, AND DIES, IRON COCKS, &c.

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EVERY DESCRIPTION OF TUBING, GAS, STEAM, HYDRAULIC TUBES AND FITTINGS,
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CHANDELIERS, &c., GAS-FITTERS' TOOLS, GAS TONGS, STOCKS, TAPS, DIES, &c., &c.,
HANDRAIL TUBINGS, IRON AND BRASS, PLAIN OR TWISTED,
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PRIZE MEDALS—1862, 1867, 1871, 1874.

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GIROUD'S PATENT RHEOMETER.

This Instrument is easily fixed under any Burner; it regulates the volume of the Gas to be consumed, notwithstanding the Size of the Burner or the Variation of Pressure.

Full particulars on application, also PAMPHLETS on the "Advantages of Heating and Cooking by Gas," with Illustrations, &c., of the latest and most improved

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And other new Patent Heating Stoves under China and Terra Cotta Covers.

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LONDON WHARF:

Wharf No. 4, inside Great Northern Goods Station, King's Cross, N.;

LIVERPOOL—1, Back Leeds Street,

Where is always kept a Stock of Retorts, Fire-Bricks, Terra Cotta Ware, and Drain-Pipes.

J. T. B. PORTER AND CO.,

ENGINEERS AND CONTRACTORS,

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Beg respectfully to remind Gas Companies and Corporations that they continue to manufacture and supply every description of Apparatus connected with the

MANUFACTURE OF GAS AND ITS DISTRIBUTION.

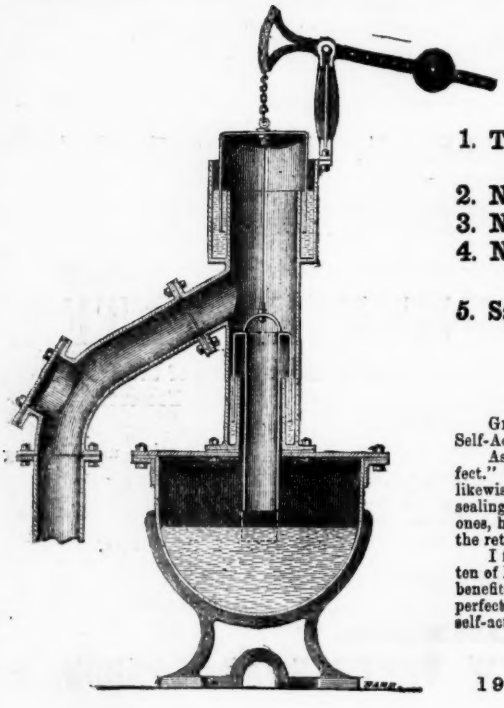
GASHOLDERS, PURIFIERS, SCRUBBERS, CONDENSERS, RETORTS, &c., &c.

PLANS, SPECIFICATIONS, AND ESTIMATES FOR WORKS OF ANY SIZE.

REFERENCES TO MORE THAN 500 WORKS ALREADY ERECTED.

PROSPECTUSES AND TESTIMONIALS ON APPLICATION.

SELF-ACTING REMOVABLE DIP-PIPE,



PATENTED BY

CHANDLER & STEVENSON.

ADVANTAGES.

1. There is no pressure on the Retorts.
2. No deposit of Carbon.
3. No scurfing is required.
4. Never a choked Ascension-Pipe.
5. Saves Fuel and Wear and Tear.
6. Gets 10 per cent. more Gas out of the Coal, and a higher Illuminating Power.
7. Is never out of order.
8. Requires no attention.
9. Is perfectly automatic in its action.

TESTIMONIAL.

Metropolitan District Asylum, Caterham, Surrey, Dec. 14, 1874.

MESSRS. CHANDLER AND STEVENSON.

GENTLEMEN,—I have much pleasure in bearing testimony to the complete working of your "Patent Self-Acting Dip-Pipes," which have now been in constant operation over three months.

As regards the action of the apparatus, I can describe it no better than by calling it "simply perfect." Immediately the retort is charged and the lid secured, the small holder rises, which lifts the Dip; likewise the instant the gas is permitted to escape at the mouthpiece the holder falls, thus perfectly sealing the Dip. I am fully convinced of the superiority of these Self-Acting Dips over Non Self-Acting ones, having experienced the fact that stokers do occasionally neglect to unseal the Dip after charging the retort, thereby causing a waste or loss.

I feel that it is quite unnecessary for me to say more on the subject, excepting that, having had ten of Messrs. Chandler's Dip-Pipes in use more than one year, and having experienced the great benefits derived thereby, inasmuch as the yield of gas from the coal is greatly increased, and the retorts perfectly free from carbon and other advantages, and seeing that the same Dip has been made perfectly self-acting by the second patent, I feel convinced that this is the right thing.—Yours obediently,

W. CRICKMAY, Resident Engineer.

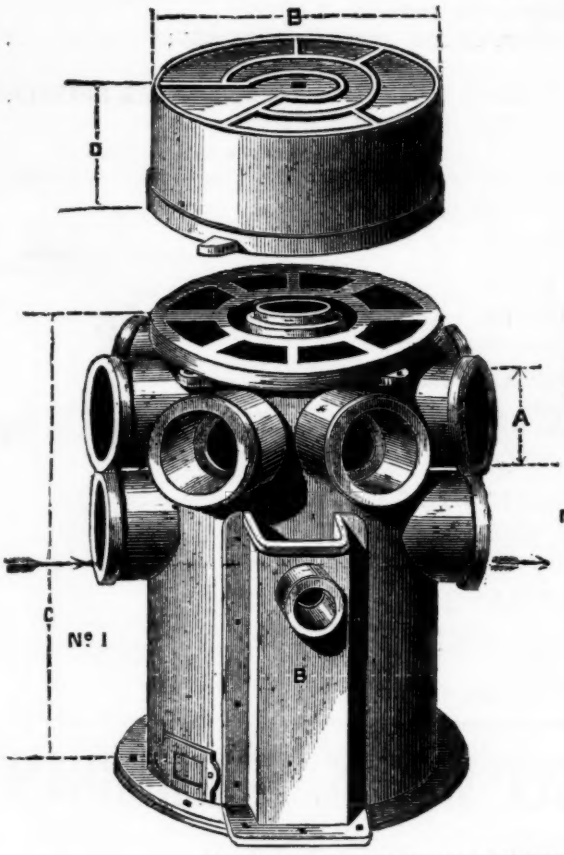
For terms of use and cost, apply to Mr. G. W. STEVENSON,

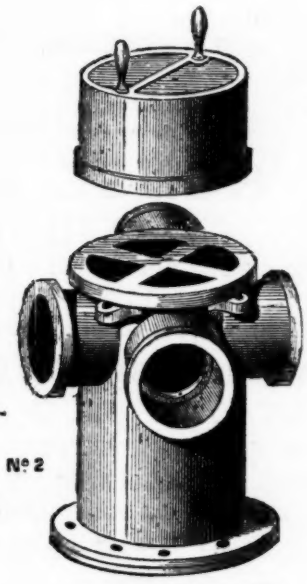
19, GREAT GEORGE STREET, WESTMINSTER.

MESSRS. NEWTON, CHAMBERS, & CO.,

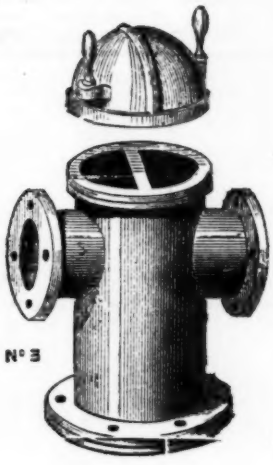
THORNCLIFFE IRON-WORKS, NEAR SHEFFIELD.

IMPROVED CENTRE-VALVES.





THORNCLIFFE
IMPROVED BYE-PASS VALVE.
SIZES FROM 3 INS. UPWARDS.



THORNCLIFFE
IMPROVED STOP-VALVE.
SIZES FROM 3 INS. UPWARDS.

Sizes of the THORNCLIFFE IMPROVED CENTRE-VALVE.

	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.
A. Bore of Pipe. . .	4 ..	5 ..	6 ..	7 ..	8 ..	9 ..	10 ..	12
B. Diameter of Body.	16 ..	20 ..	23 ..	26 ..	28 ..	31 ..	34 ..	40
C. Height of Tank .	33 ..	35 ..	38 ..	43 ..	46 ..	48 ..	51 ..	56
D. Depth of Cover .	8 ..	9 ..	10 ..	11 ..	12 ..	13 ..	14 ..	16
Total Height . .	44 ..	44 ..	48 ..	54 ..	58 ..	61 ..	65 ..	72

In all cases the Covers are cast heavy enough to resist any required pressure.

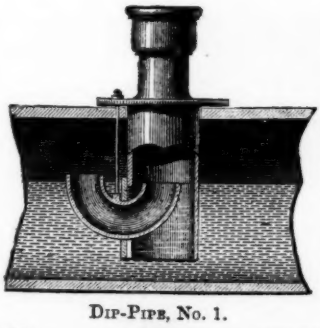
The advantages derived from the adoption of these Valves are so manifest and cardinal that in the immediate character of the change—the simplicity of the machine—the facility affording for cleaning out connexions between Valve and Purifier—the perfect collection and delivery by suitable overflow of the ammonia, at a greatly diminished depth from ground-line over the old form of Valve—the advantage of connecting on the same level, and at any angle, or opposite to each other, the inlet and outlet pipes without dip or rise—the clear acquisition of space in the purifying-house, by being able to place the boxes nearer together, the new Valve being entirely under the floor—and lastly, though of the greatest importance, the passage of crude and unpurified gas during the change is minimized to the merest fraction, thus preventing the fouling by impure gas the delicate machinery and easily affected exposed movements of the station-meter, thereby preventing the introduction of the enemy (unpurified gas) into the gasholder. Also a dead abutment is offered to all back pressure, imparting thereby to the gauges, governors, and hydraulic seals, a steadiness of action never realized with the once famous, but now fast becoming obsolete, Hydraulic Centre-Valve.

N., C., and Co. also Manufacture and Erect

PURIFIERS, CONDENSERS, SCRUBBERS, GASHOLDERS, ROOFS,

And every description of Gas Machinery.

TENDERS GIVEN FOR WORK FIXED COMPLETE IN ANY PART OF THE KINGDOM.



DIP-PIPE, No. 1.

Messrs. N., C., and Co. are also the Sole Agents for

HAWKINS' PATENT SELF-ACTING HYDRAULIC DIP-PIPES.

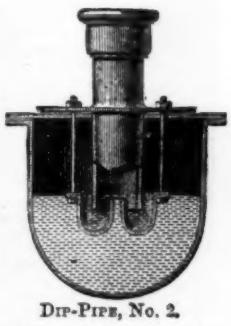
By their use the whole of the pressure caused by the Seal in the Hydraulic Main is entirely avoided, thus securing the many advantages long sought for.

Over 50 Gas Companies have already been supplied with them, many of which have been using them throughout their entire works continuously for over two years.

They can be applied to existing Hydraulic Dips, and at a very small cost.

They seal themselves in the same manner as the ordinary dip-pipes, therefore they are not likely to get out of repair.

By the aid of the adjusting screws they can be made to work on the old principle at pleasure.



DIP-PIPE, No. 2.

FOR PRICES, TESTIMONIALS, &c., APPLY TO

Messrs. NEWTON, CHAMBERS, & CO., Thorncliffe Iron-Works, near Sheffield, Sole Agents;

OR TO THE PATENTEE,

J. G. HAWKINS, NEEPSEND GAS-WORKS, SHEFFIELD.

JAMES OAKES & CO.,
ALFRETON IRON-WORKS, DERBYSHIRE,
AND
WENLOCK IRON WHARF, 20 & 22, WHARF ROAD
CITY ROAD, LONDON, N.,
Beg to inform Gas and Water Companies and the public, that they keep in stock in London all the CASTINGS in general use in Gas and Water Works, including Iron Retorts, Socket and Flange Pipes, Bends, Branches, and Syphons of all sizes, Lamp Columns, &c., &c.
N.B.—Orders for Cast-Iron Tanks, Girders, Columns, Cylinders, and all irregular castings, will have immediate attention. CHARLES HORSLEY, Agent.

INTERNATIONAL EXHIBITION, 1862.
CLASS X.
PRIZE MEDAL
For excellence of Fire-Clay Gas Retorts, and
"HONOURABLE MENTION" for
good quality of Fire-Bricks.
WILLIAM STEPHENSON & SONS,
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STATION-METERS, GOVERNORS, CONSUMERS METERS, GAS LUSTRES, CHANDELIERS, BRACKETS, &c.,
And every description of Gas-Fittings and Gas Apparatus.

HODGE & CO.'S
IMPROVED VENTILATING SUN-LIGHTS
WITH TALC REFLECTORS AND SELF-ACTING VALVES
TO PREVENT DOWN-DRAUGHT;
VENTILATING GLOBE LIGHTS for DINING-ROOMS, LIBRARIES, &c.
Ormolu, Bronze, & Crystal Gaseliers;
MEDIÆVAL CHURCH WORK AND CORONÆ
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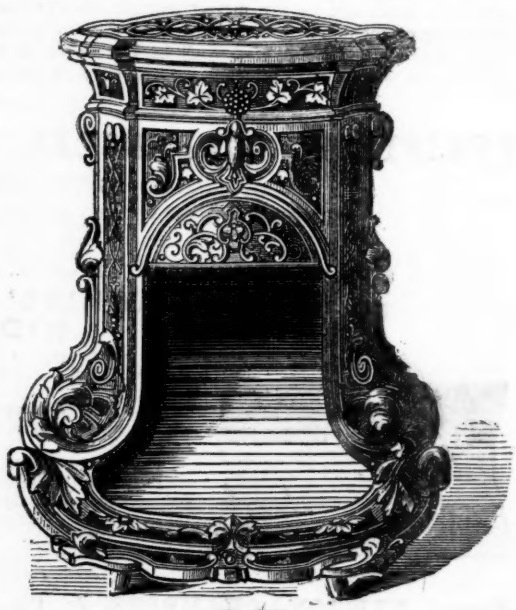
BLACK AND GALVANIZED BARREL COMPO AND TIN PIPE.
GAS ENGINEERS,
100, HATTON GARDEN, LONDON.
Drawings and Prices upon application.

JOHN WRIGHT AND CO., ESSEX WORKS, BIRMINGHAM,
Beg to call the attention of MANAGERS and DIRECTORS of GAS COMPANIES to the following letter which they have lately received.
COPY OF LETTER RECEIVED FROM MAGNUS OHREN, Esq.
To Messrs. John Wright and Co., Essex Works, Birmingham. *Crystal Palace District Gas Company, Lower Sydenham, S.E.*
Dear Sirs,—In reply to your inquiries, I am glad to state that the use of GAS COOKING AND HEATING STOVES has been a complete success here. We have several hundred in use in our districts. We also find it advantageous to let out Stoves at a small rental. We have now 275 Stoves at rent.
The Stoves you make I can with confidence recommend, having so many in use, and giving satisfaction. I need scarcely point out to you the advantage to Gas Companies to recommend the use of Gas Stoves to their Gas Consumers, even where they do not supply them on sale or rent, as the use of Gas Stoves brings day consumption, and thus the Company make a profit by day as well as by night.—I am, dear sirs, yours faithfully, MAGNUS OHREN.

Size, 25½ in. high; 14 in. wide; 12½ in. back to front.
Price 50s., complete with Pan and Gridiron.

GAS HEATING STOVES
(TERRA COTTA AND IRON).
THE CHEERFUL STOVE.
COOKING STOVES.
BREAKFAST COOKERS.
BATHS HEATED by GAS
GAS STOVES
For Boiling, Broiling, Preserving, Heating Flat Irons, and for all other Domestic Purposes.
Gas Companies and the Trade who have not our Illustrated Catalogue are respectfully requested to apply for same.
A LIBERAL DISCOUNT to the TRADE.

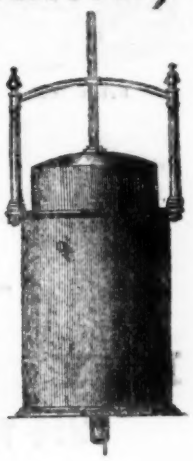


No. 4003.
THE CHEERFUL GAS STOVE, with Copper Reflector
Has all the appearance of a Bright Fire.
PRICE from 32s.

TANGYE BROTHERS AND HOLMAN,

LAURENCE POUNTNEY LANE,

LONDON.



SOLE MAKERS OF HUNT'S PATENT

EQUILIBRIUM GAS GOVERNOR.

In this Governor a Throttle-Valve is substituted for the ordinary suspended Cone, all external communications being avoided by placing the Lever or Radius Arm (shown at C on the drawing) inside the Valve-Chamber upon the Disc. The Disc is carried upon steel centres, upon which it is accurately balanced and turns freely. The friction in working is thereby reduced to a minimum. This Governor is extremely sensitive to alterations of inlet or outlet pressure, and renders a large actuating holder unnecessary.

The principal advantages of this arrangement over the ordinary form of Governor are as follows:—

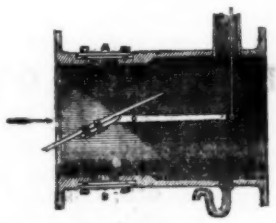
Its sensitive action prevents oscillation.

It is self-adjusting—*i.e.*, it maintains a steady pressure under variations of inlet pressure or a fluctuating consumption.

The inlet to Gasholder being contracted to the smallest possible dimensions, all danger from leakage through insufficiency of seal, tilting, &c., is entirely avoided.

The valve portion being separate from the holder, it can be handled and fixed like an ordinary Slide-Valve direct in the main; and the holder can be placed at any convenient distance immediately above it. The cost is thus materially reduced, and the inconvenience of heavy lifts done away with.

There are no working parts likely to get out of order.



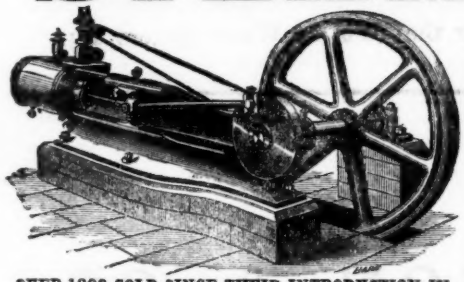
These Governors have been adopted by several leading Gas Companies, among whom are the following:—

The Gaslight Company—two 36 in. at Blackfriars.
" " a 36 in. at Goswell Road.
" " a 24 in. at "
" " a 24 in. at Whitechapel.
" " an 18 in. at Bow Common.
" " a 24 in. at Beckton.
" " a 6 in. at "
The London Gas Company—a 24 in. at Nine Elms.
" " an 18 in. at "
" " an 8 in. at "

The Exeter Gas-Works—a 24 in.
The Abergavenny Gas-Works—a 10 in.
The Birmingham Gaslight Company—an 8 in.
The Monmouth Gas-Works—an 8 in.
The Devonport Gas-Works—an 8 in.
The Cannes Gas-Works (France)—an 8 in.
The Mentone Gas-Works (France)—an 8 in.
The Rochdale Gas-Works—a 4 in.
The Imperial Gas Company, a 12 in at Great Cambridge Street.

TANGYE'S HORIZONTAL HIGH-PRESSURE EXPANSIVE

STEAM-ENGINES.



OVER 1200 SOLD SINCE THEIR INTRODUCTION IN DECEMBER, 1869.

In designing this Engine the utmost regard has been paid to simplicity of arrangement, strength of construction, and economy in cost. The working parts are considerably reduced in number, as compared with Horizontal Engines generally, rendering it far more durable and compact, the bed-plate, front cylinder cover, guides, and plummer-block for crank-shaft bearing being all cast in one piece, which in design and proportions is admitted by competent engineers to be perfect, and to afford a strength and rigidity that cannot possibly be attained in the best fitted engines of the ordinary horizontal type. The extraordinary stiffness of this Engine will permit of its being driven at a much greater maximum speed than engines generally, and with far less wear and tear. The cylinder with its valve-chest is bolted to the end of the bed. The cross-head slippers and connecting-rod ends are made adjustable, so that any wear can be readily taken up. The fly-wheel, cylinder-end, connecting-rod, and crank-plate, are all bright. All the parts are made to Whitworth's Gauges, and the material and workmanship are of the highest class throughout.

The Governor is of a very special description, and combines in the small space usually occupied by the ordinary steam stop-valve, a governor, throttle-valve, and stop-valve complete. It is exceedingly sensitive, simple, and compact.

These Engines are adopted in Gas-Works at Haggerston (Independent Gas Company), Nine Elms (London Gas Company), Falmouth, Harrow, Jersey, Plymouth, Richmond, Rochdale, Santiago (Chili), &c.

VIENNA EXHIBITION, 1873.—The highest prize and only Medal "for Progress" for Direct-Acting Steam Pumps for general purposes was awarded to TANGYE BROTHERS AND HOLMAN, for

THE "SPECIAL" DIRECT-ACTING STEAM PUMPS.

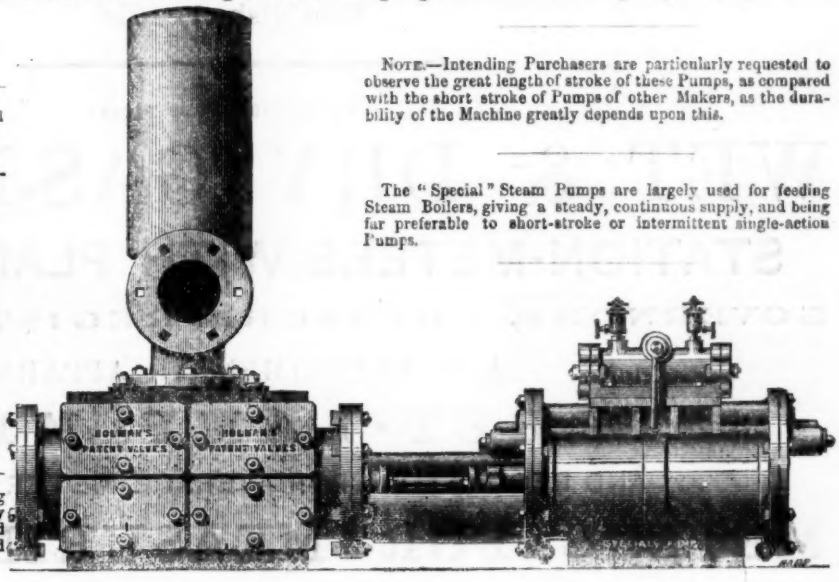
4000 have been sold since their introduction in 1867.

In use in over Eighty Gas-Works in the United Kingdom for Pumping Ammoniacal Liquor, Water, or Tar.

The following are a few of the leading Sizes:—

Diameter of Steam Cylinder.	Diameter of Water Cylinder.	Length of Stroke.	Gallons of Water per Hour, Approximate.	Reduced Prices.
3	1½	9	550	£16
4*	2	9	970	18
3	3	9	2,200	18
4*	3	12	2,200	20
6*	3	12	2,200	25
4	4	12	3,900	25
6*	4	12	3,900	30
6	5	12	6,100	35
7*	5	12	6,100	40
6	6	12	8,800	40
8*	6	12	8,800	50
7	7	12	11,900	50
10*	7	12	11,900	65
8	8	18	15,660	65
10	8	18	15,660	75
10	10	24	24,400	100

* These sizes being usually selected for pumping Tar and Liquor, are always in stock, or nearly ready, fitted with all pump details in iron, and extra length distance piece between steam and pump cylinder at a small extra cost.



NOTE.—Intending Purchasers are particularly requested to observe the great length of stroke of these Pumps, as compared with the short stroke of Pumps of other Makers, as the durability of the Machine greatly depends upon this.

The "Special" Steam Pumps are largely used for feeding Steam Boilers, giving a steady, continuous supply, and being far preferable to short-stroke or intermittent single-action Pumps.

London 1851. New York, 1853 Paris, 1855. London, 1862.

Dublin, 1865.

The SIX MEDALS AWARDED to THOMAS GLOVER for

PATENT DRY GAS-METERS,

The latter being the Highest Medal awarded for Dry Gas-Meters by the Imperial Commissioners for the Universal Exhibition, Paris, 1867.

Paris, 1867.

THOMAS GLOVER & CO.,

DRY GAS-METER MANUFACTURERS,

214 TO 222, ST. JOHN STREET, CLERKENWELL GREEN,

LONDON, E.C.

THOMAS GLOVER & CO.'S PATENT DRY GAS-METERS,

1st, Are a remedy for all the defects of Wet Meters;
2nd, Are suitable for all climates, whether hot or cold;
3rd, Incur no loss of Gas by evaporation;
4th, Cannot become fixed by frost, however severe;
5th, Are the most accurate and unvarying measurers of Gas;
6th, Prevent jumping or unexpected extinction of the Lights;
7th, May be fixed either above or below the level of the Lights;
8th, Cannot be tampered with, without visibly damaging the outer case;
9th, Will last much longer than Wet Meters;
10th, Will not cost more than one-half for repair that Wet or Water Meters do;
Are upheld for five years without charge.

WILLIAM PARKINSON & CO.,

(SUCCESSORS TO SAMUEL CROSLEY,)

COTTAGE LANE, CITY ROAD, LONDON, E.C.

Established 1816.

MANUFACTURERS OF PATENT

WET & DRY GAS-METERS,

STATION-METERS WITH PLANED JOINTS,

GOVERNORS, PRESSURE REGISTERS, GAUGES,

AND EXPERIMENTAL APPARATUS,

STREET-LAMP METERS,

AND REGULATORS FOR AVERAGE METER INDICATION.

METERS FOR MEASURING WATER.

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TO CORRESPONDENTS.

We cannot undertake to insert communications received later than Saturday morning in the forthcoming number of the JOURNAL.

R. W. B., Hertford.—*Your letter is to hand, but not the report mentioned therein. We shall be glad to have it soon.*

C. H., Whitchurch; W. P.A., Saltburn; W. C., Liverpool; J. H., Barnsley; G. B., Goole; W. J., Clippins; W. C., Aberavon.—*Communications received, will be inserted in our next.*

G. S., Haslemere, *asks how it is that so little has been heard of late of the Coal Economizing Gas Company. We cannot answer the question.*

THE JOURNAL OF GAS LIGHTING,
WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, FEBRUARY 23, 1875.

Circular to Gas Companies.

THE atmosphere is a little cleared. The Metropolis Gas (New Works) Bill has gone, and with it a good round sum of money. If we are not mistaken, something like a fortnight was given for the preparation of this Bill, the preamble of which sets forth that, "whereas plans and sections, describing the lines, situations, and "levels of the intended railway and other works, with books of "reference, &c., &c., &c., have been deposited with the respective "Clerks of the Peace" for three counties, &c. Now, everybody knows that engineers, surveyors, and draftsmen do not work under pressure for nothing, or, indeed, at any time for very little. We shall here make no guess as to what the elaboration of the Bill has actually cost; but we do hope that some independent member of the Metropolitan Board, or the Corporation of London, will endeavour to find out what the preparation of this measure, which it was never expected, and was never intended, to pass, has cost the ratepayers of London. We are, of course, always pleased to see engineers and the allied classes well rewarded; and, if money must be squandered, it could not go to a more deserving set of men. But other things must be taken into consideration; and on this occasion we must distinctly charge the Corporation of London and the Metropolitan Board with a shameful waste of public money. If they had at any time thought the Bill to be useful, and had promoted it earnestly, we should not so much have blamed them. But to incur all this expense for a measure born only to die, and, indeed, intended to be smothered at its birth, we regard as little less than criminal. After having been cautioned over and over again that such a Bill had no chance of success, they persisted in incurring the expense of its preparation, and immediately and deliberately abandoned it.

The second reading of the Purchase Bill has been postponed until this evening, when Colonel Beresford (as we see he is still called) is to move its rejection. In this it is possible that Sir James Hogg may concur, for it must be evident to every member of the Metropolitan Board that they are not competent to manage so vast a business as the gas supply of this metropolis. They are overburdened with work already, as is sufficiently shown by the haste and indecision which has characterized their proceedings on this gas business. Apart from that, the proposals of the Bill are not such as will commend themselves to an essentially commercial House of Commons. Whether or not the Bill will be rejected to-night, depends on the action taken by the Government, who have, we believe, some general measure relating to gas affairs in preparation. In any case, we cannot imagine that the Government, who are tolerably well advised on gas matters, will allow a Bill to pass which is flagrantly unjust to the gas companies, and promises no single advantage to the gas consumers.

Just as we were going to press, we receive the announcement that late last night, it was determined to withdraw the Purchase Bill.

The Metropolis Gas Companies Regulation Bill has been printed, and now lies before us. The provisions it was intended to embody, were sketched in the report of the Parliamentary Committee of the Metropolitan Board of Works, which we printed in our issue for Feb. 9 (*ante*, p. 185); and in the main the instructions of the committee have been closely followed by the draftsman. He has, however, for a reason which will be found in another column, omitted the auction clause, to which the committee appeared to attach some importance. As this Bill is, by a general concurrence of opinion, regarded as the real *cheval de bataille* of the metropolitan local authorities, we may again briefly refer to some of its provisions. There was an obvious desire, at the last meeting of the Metropolitan Board, to suppress any discussion on the Bill; but it was of no importance, for it must be accepted as a fact, that the proposals of the committee had already been agreed to by the Board. The Bill is to bring all the metropolitan gas companies under uniform regulations, which it will effect by repealing portions of the Act of 1860, the whole of the City of London Act of 1868, and any part of a special Act of any company—such, for example, as the revision clauses of the Imperial and South Metropolitan Companies—which are deemed inconsistent with this measure. Uniformity of quality and price is then proposed; and then follow clauses, borrowed, in the main, from the Act of 1868, for the appointment of referees, examiners, and chief examiner. As regards the three referees, however, it is intended that one shall be appointed by the Board of Trade, one by the Metropolitan Board, and the third by the Corporation of London. We fail to see, in this proposal, any guarantee for the appointment of "competent "and impartial persons." The elect of the local authorities would practically be the officers and advocates of those authorities, who, elected for only one year, would be liable to dismissal if they did not act according to the wishes of the electing authority. We do not expect that the Board of Trade will consent to relinquish the patronage involved in the appointment of three gas referees; but if they should consider the election here proposed advisable, we must contend that the third referee should be nominated by the gas companies. In this event, it is certain that there would be one competent referee, and one quite as likely to be impartial as the others, elected by the authorities. The duties proposed for the referees are much the same as they now perform, but it is intended to take from them the power to change the test-burner. On this point we could only repeat what we said a fortnight ago. The duties of the gas examiners will also be much the same, but their number will be largely augmented. About twenty will be required, besides the superintending examiners, which will cost the metropolitan ratepayers £3000 a year. Similarly, the chief gas examiner remains in the same position as before; but, in the interest of any one who may hold that important office, we must point out the unreasonableness of section 33 of this Bill, which requires the chief examiner to send in his quarterly reports to the authorities, and all the com-

panies, within three days of the expiration of the quarter. If any member of the Board will consider the labour involved in making up and tabulating the returns from all the testing-stations, which will be required if this Bill should pass, he will see that a month would not be too long a period for the preparation of the returns and the reports.

We have omitted to notice the clause embodying the eighth proposal of the Metropolitan Board—viz., that the illuminating power of the gas shall never in the 24 hours be below 16 candles. The clause inserted provides that the *lowest* of all the testings of illuminating power on each day shall be deemed to represent the illuminating power on that day. Now this is so obviously unfair that we are quite certain Parliament will never consent to enact it. If it were possible to produce gas at all times of a perfectly uniform quality, such a provision would be all very well. But every one who knows anything about the manufacture is well aware that, from circumstances over which the manager has little or no control, the quality of the gas produced will vary, and the wonder is that the limits of variation are not wider than they are seen to be.

Not much need be said about the sections relating to the accounts of the companies. There is, of course, to be an official auditor, and it is intended that one of his first duties shall be to ascertain and certify how much of the capital of the Chartered Company ought fairly to be apportioned to the district within the City. This statement, we may take it, is intended as a basis for possible negotiations between the City and Metropolitan Board at some future time. There is, we rather think, some obscurity in section 43. As we read, somewhat hastily, it appears to us that no company will be able to declare a dividend until the accounts are audited and certified, and laid before both Houses of Parliament, unless (which looks odd) the accounts are found to be incorrect, in which case the auditor may grant a conditional certificate to authorize the payment of a dividend, subject to correction. If this should be enacted, half-yearly meetings for the declaration of dividends will be abolished, and the business of the companies seriously interfered with. We may not be right, but we think the words of the section justify our interpretation.

We stated before our objections to the limitation of dividends, if the standard price be exceeded, and need not repeat them here. In one respect we rather think the Bill is more liberal than its promoters intend. Take the case of the South Metropolitan Company. They may charge 3s. 9d., pay maximum dividends, and transfer 1 per cent. per annum to an insurance-fund; and may carry any excess to the divisible profits for the next year; and so on, so far as we can see, year after year, until they have accumulated a sum, which, when they require new a capital, may be divided *pro ratâ* among their shareholders as a very pretty bonus.

There are, beyond the foregoing, some provisions respecting amalgamation, which necessitate the consent of the Metropolitan Board to the combination, after which an Order in Council may authorize it; and there are some other ordinary provisions which need not be noticed. We shall not speculate on the chances the Bill has of success. Mr. Newton, who knows more than any one else of the wishes of the gas agitators, says that, if it be passed, the authorities will be content to leave the supply of gas in the hands of the companies. Granted, however, that some measure of the kind proposed does pass, we are certain that one, in several respects different from this, will receive Her Majesty's assent.

The Bill put forward—we can hardly say promoted—by the Phœnix Company, has fallen through, in consequence of non-compliance with Standing Orders. In the absence of agreements with the companies with whom it was proposed to amalgamate, we do not suppose the Bill had any chance, and the small expense incurred, as it is, might as well have been saved. The Select Committee on Standing Orders are to take the petition of the Chartered Company into consideration to-day.

A number of petitions have already been presented against various gas Bills, which, of course, seem to foreshadow the nature of the opposition which will be raised against them. Most of the London companies, and some District Boards, have petitioned against the Metropolis Gas Undertakings Purchase Bill. The Birmingham Corporation Bill is opposed by surrounding local authorities, but we believe the opposition is only to obtain self-protection, and not to procure the defeat of the Bill. The Imperial and Commercial Companies Bills are opposed by the Chartered Company, and naturally petitioned against by the Metropolitan Board. Plenty of work is being cut out for the committees, to which these several Bills will be referred, and it is clear that this year's parliamentary proceedings will be of unusual interest.

We may mention here that the share capital proposed by the gas Bills in Parliament this year amounts to a sum of £3,473,494, carrying borrowing power to the extent of £1,083,750. The Provisional Orders applied for, seek to raise capital to the amount of £394,980, with loans to the sum of £93,495, making together a total share and loan capital of £5,045,719. At the same time the Corporation Gas Bills propose to raise a sum of £846,000, but in the return we quote from, no estimate is made of the annuities to be granted, nor, as a matter of course, of the sum which would be required by the Metropolitan Board of Works should, by any accident, the Purchase Bill become law. The figures, as they stand, however, are of great interest, as showing the amount which is likely to be expended, within the next few years, in the extension of legitimate commercial undertakings.

The meeting convened by the directors of the Tunbridge Wells Gas Company, a brief report of which will be found in another column, was, if not altogether a success, not wholly unsatisfactory. Of course, agitators attended, and caused interruptions; but statements which pass current, and are accepted as expressions of truth, cannot be repeated in the presence of those who are able to correct them on the spot.

There seems to us now to be but a small matter of dispute between the commissioners and consumers of Tunbridge Wells and the gas company, and that is the maximum price. The company propose to continue their present maximum, 6s.—a price they have never charged. The commissioners, and others, appear to wish it reduced to 5s. Let them split the difference, and make it 5s. 6d., and save a lot of expense, which will benefit no one concerned.

The Town Council of Manchester would appear to have abandoned the site proposed for new gas-works near Pbillips's Park, and are considering another position — a peat bog—2½ miles away from the city. A fortnight ago we adverted to the urgent need of additional gas-works for Manchester, and it is with some surprise that we read the remarks of a town councillor, who "maintained that gas was not a necessary of life, like air and "water. Even," he said, "if people were short of gas for a day "or two in the depth of winter, they could manage to do without "it." That may be, and, indeed, has been proved to be true, under unavoidable circumstances; but what if a gas director had expressed the opinion, instead of a town councillor?

The Ipswich Gas Company, under the able management of Mr. Goddard, pursue a prosperous career, and are able to pay full dividends for the past year. We refer to the meeting, more particularly to call attention to the remarks of Mr. Goddard respecting the Plymouth Gas Company, whose low charge is constantly thrown in the teeth of less fortunate companies. Mr. Goddard explained what, perhaps, has been a mystery to many of our readers—how it is that the Plymouth Company can charge so low a price.

The report of the directors of the Imperial Company, to be presented to the next general meeting, shows that, in their case, the decision of the revising commissioners has not been so advantageous as was anticipated. They are able to pay full dividends, but the amount to be carried to the reserve-fund is £30,000 short of that calculated by the commissioners. The cause of this is said to be the depreciated value of coke. The directors take a more hopeful view of their prospects during the current year than we do. It will, we think, require a very considerable diminution in the price of coal, and the maintenance of full value for coke all through the year, to make the profits suffice for full dividends, even when assisted by the reserve-fund of £48,000. The report naturally alludes to the proposed legislation. Before the directors meet the shareholders, the conditions, we think, will be greatly changed. They will find, we believe, that they have only the "Regulations Bill" to fight, and the struggle will be to obtain the insertion of revision clauses, or to defeat the measure altogether. The accounts show that the sale of gas has been equal to 8600 feet per ton of coal carbonized.

When speaking of the Pottery towns generally, last week, we should have excepted Longton, in which town the enterprising gas company maintained a most efficient supply all through last winter, at the low price of 3s. 6d. The report of the directors, to be presented to the half-yearly meeting on Friday, shows a considerable expenditure on the enlargement and rearrangement of the distributory plant, to meet the rapidly increasing wants of the district. The company can pay full dividends out of the profits of the half year.

Londoners who grumble at 16-candle gas may be astonished to learn that, many in Dumfries loudly complain of gas reported to have the illuminating power of 26 candles. It must, we fear, be accepted as a fact, that gas consumers will never be perfectly satisfied.

Mr. Cleminshaw has, we are glad to see, obtained a verdict against the Corporation of Dublin for £513, the full amount of his bill. A point of law has, however, been reserved, and we shall probably hear more of the case.

The average meter system is giving satisfaction in Southampton, where a saving on the past year of £453 is reported as a consequence of its adoption.

Water and Sanitary Notes.

The almost exhaustive lecture by Dr. Letheby on "Noxious and Offensive Trades and Manufactures," &c., the publication of which we conclude to-day, is very explicit on the best means of abating and preventing nuisance. But there is one point we would press on the attention of enthusiastic sanitarians, and that is, the advisability of distinguishing between "noxious" and "offensive" vapours. Dr. Letheby appears to use the words as synonymous; but, etymologically and practically, they have a very different meaning. A vapour may be offensive to the nose, and yet have no prejudicial effect on animal or vegetable life; and, on the contrary, an odour may be agreeable, and still, like that of violets, which is said to induce epilepsy, be noxious. And then a vapour may be noxious to vegetation, and yet have no perceptible effect on animal life. The mortality at St. Helens, before the Alkali Act was passed, we believe, was never so great as that in the crowded districts of Liverpool and Glasgow. The importance of the question to vast numbers of our labouring population, who must live near to their employment, should make medical officers cautious in their dealings with these alleged nuisances, complaints of which often come from people at a distance. Really "noxious" vapours should be repressed with a stern, unrelenting hand; but the majority of the complaints are made of smells which are in no degree harmful, though admittedly offensive. The nose soon becomes accustomed to these, and they make no impression on the senses of those who continually live among them. It is most often the inhabitants of a villa, a mile away from the offensive works, who only get an occasional "whiff," who make the complaints, which, if attended to, would end in the destruction of an industry, and the displacement of a large population. These are important considerations, and for that reason we, in these days, when we are threatened with a crusade against every manufacture which produces a smell, advise caution and forbearance in proceeding against them. We refer more particularly to the metropolis, from which there are many who would banish every so-called "offensive" manufacture. We may point out, however, that wherever factories go, a large population necessarily go with them. They went to Bow Common years ago, and it is now completely enclosed with buildings. They are now going to Belvedere, and already a town is rising up in the neighbourhood.

The Water Bills before Parliament this year propose to raise share capital to the amount of £2,708,370, carrying borrowing power to the extent of £696,700. The Provisional Orders ask power to raise capital to the amount of £134,500, and to borrow £53,625, making a grand total of £3,593,195 proposed by water companies. The Corporation Bills propose loans to the extent of £1,505,600 for water-works purposes; but this sum does not include the million the Corporation of Birmingham may require, if they purchase the water company.

The Corporation of Blackburn have decided on the purchase of the water company, who have agreed to accept 9 per cent. annuities for the next five years, and 9½ per cent. in perpetuity afterwards, and have thereby made a very good bargain. A bitter dispute is thus satisfactorily ended, and we may wish the Corporation success in their management of the undertaking. The works will soon require large extensions, but all the company hand over are in a most perfect condition.

The Corporation of Leicester have resolved on opposing the Bill of the water company, and are supported in their resolution by a meeting of owners and ratepayers, under the Borough Funds Act. It would seem that the Corporation wish to share in the surplus profits on the new capital proposed by the Bill, but only to a very small extent. Being large shareholders, the Corporation might, we think, be content with the profit on their shares; but the matter in dispute is really a very small one—only £157 a year—and, surely, this might be arranged without an expensive parliamentary contest.

A pamphlet has been published by Mr. E. Monson, on the "Advantages of the Separate System of Drainage." The whole title is much too long to quote. The author appears to have been very successful with works in the small town of Halstead, Essex, and he recommends the application of his system to this metropolis. There is much to be said in favour of the separate system, and it is quite possible that the sewerage system of the metropolis may some day be reconstructed in obedience to Mr. F. O. Ward's famous principle, "The rainfall to the river, the "sewage to the soil," but long years must elapse before the work is undertaken. There are some suggestions in this pamphlet which metropolitan engineers may as well take into consideration, and we need only add that it may be bought of E. and F. N. Spon, Charing Cross.

A TREATISE ON THE SCIENCE AND PRACTICE OF THE MANUFACTURE AND DISTRIBUTION OF COAL GAS.

LII.

The Station-Meter.

The capacity of a station-meter, suitable for a given gas-work, is dependent on the maximum production of gas per hour. Thus, if this be, say, 2400 feet, the wheel of the meter should be of such dimensions as to deliver 20 feet at each revolution.

Subjoined is a list of the maximum production per hour, the corresponding capacity of revolution of meter-wheel, and the average prices of well-known firms for station-meters, delivered at a railway station, subject to discount for cash.

Maximum Hourly Production of	Capacity of Revolution of Wheel.	Price of Meter, including stamping.
600 cubic feet	5 cubic feet	£38
1,200 ,,	10 ,,	45
1,500 ,,	12½ ,,	51
1,800 ,,	15 ,,	56
2,400 ,,	20 ,,	62
3,000 ,,	25 ,,	68
3,600 ,,	30 ,,	80
4,800 ,,	40 ,,	92
7,200 ,,	60 ,,	110
9,600 ,,	80 ,,	125
12,000 ,,	100 ,,	150
24,000 ,,	200 ,,	220

Beyond these sizes, the prices are arranged by special agreement; for the tell-tale apparatus, an addition of £10 10s. must be made.

The annexed engraving represents an index for a station-meter of large dimensions, provided with that most indispensable machine in a gas-work—a clock—also a "tell-tale" apparatus, which records the production of gas during each successive hour. For this ingenious contrivance we are indebted to the late Samuel Crosley, and it was applied for the first time by Mr. Lowe, at the Chartered Gas-Works, in 1823.

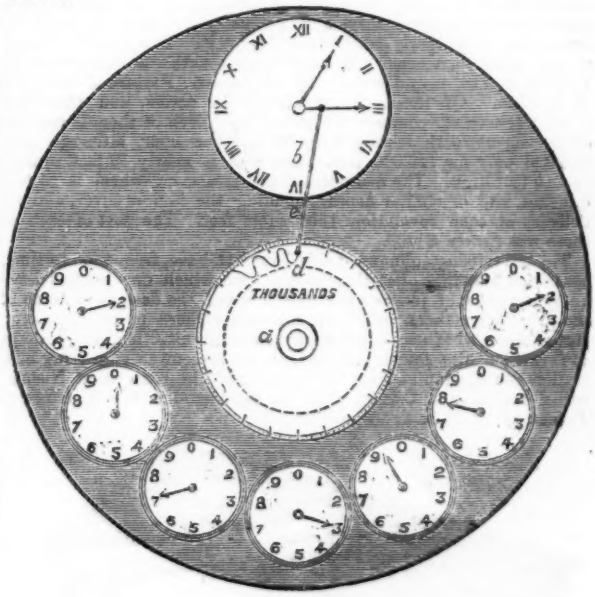


Fig. 8.

The dials of station-meters, unlike those of consumers meters, are made so that their figures are placed in the same direction, and, of course, their hands revolve in like manner—a very desirable arrangement, as it facilitates the reading of the index, and diminishes the liability to error. In the centre is a circular disc, fixed to an arbor, which gears with the general index; the rotation of this disc corresponding with the maximum daily production of the meter, of which it forms a part. Thus, if we suppose the daily make to be 200,000 feet, the disc will perform exactly one revolution per diem for that production.

A circular card or paper of the same size as the disc is attached thereto, by means of a small plate and thumb-screw, so that a fresh card can be placed with facility daily. The outer ring of this card is divided according to the maximum production, that in question being 200,000 feet, which may be again subdivided according to the size of the meter, or the judgment of the engineer.

The minute hand of the clock, at a short distance from its axle, is provided with a projecting stud or pin, which is connected to, and actuates, the rod, *b*, and thus gives motion to the small rod, *c*, provided with the necessary guides to keep it always in the same plane. At the end of the rod, *c*, is a pencil holder containing a soft pencil, pressed by a light spring, which marks the card, *a*. Thus, by the action of the minute hand of the clock, the pencil is caused to move to and fro in a vertical direction. If the card were stationary, the pencil would make simply a vertical line, but as the card rotates, so, in direct proportion to its speed, is formed a curve of greater or less length, which, corresponding with divisions on the card, records the

quantity of gas passing through the meter per hour during the day and night.

The "tell-tale" is both ingenious and useful, and, in our opinion, its application should be extended to small works, where the number of men employed is limited to two or three at each "shift." In such places a spirit of rivalry or jealousy often exists between them, and, at times, it is somewhat difficult to ascertain the results of their respective operations. This evil the "tell-tale" is well calculated to remove.

A want often experienced by gas managers is the means of ascertaining, by an observation of a minute, the production per hour. The mode of accomplishing this is exceedingly simple, all that is requisite being a separate dial arranged according to the maximum hourly production, but indicating sixty times the real quantity. With such a dial, the engineer or manager is enabled to ascertain at a glance the rate of production. From our personal experience of this deficiency in the station-meter, we are induced to suggest such an arrangement, and, no doubt, many of our readers will appreciate the proposition.

When station-meters are constructed of larger capacity than 20,000 feet per hour, their cases are invariably rectangular, the base and sides being formed of flat plates, or with recesses, according to the style of ornamentation. The joints are planed, and put together with bolts, the surfaces of the joints being previously smeared with cement, composed of white and red lead. This cement, although so universally employed in gas-works, has hitherto received no general technical name; therefore, whenever allusion may be made thereto hereafter, it will be termed "red mastic."

In the construction of station-meters, various manufacturers have, regardless of expense, displayed considerable ability and taste, as may be witnessed in many of our large establishments, where they may be seen of elegant architectural design, sometimes ornamented with allegorical figures, and with mottoes in Latin or Greek. Indeed, the station-meter of a large gas-work is the principal ornament of the establishment, and the most important object to present to the notice of visitors. Nor is this interest in the instrument confined only to large works, for in the smallest establishments, where the progress of the pointers of the index is easily perceived, the station-meter is always an object of attraction. Its merit, however, consists in its utility, and no gas-work, whether large or small, can be properly conducted without it. The largest station-meters which have come under the writer's notice are those for the Beckton works, manufactured by the Messrs. Parkinson and Co., of London. Of these, one is already in action, and there are three others in the course of construction. Each of them is capable of measuring with facility 150,000 feet per hour, although constructed only for 125,000 feet. The case is nearly 19 feet square, and 16 feet high. The diameter of the measuring-wheel is 15 feet 6 inches, and of similar depth, including the hollow cover, and its delivery at each revolution 1500 cubic feet. The cost of each of these was nearly £1400.

The advertising columns of this JOURNAL have, from time to time, contained drawings of station-meters, from which our readers have an opportunity of judging the excellence of the designs of some of the principal makers, and it is unnecessary here to refer to them. But to show what may be accomplished in this direction, and perhaps to furnish a hint for further designs, we present an engraving of a station-meter, adapted from the building of the museum at Nismes, called the Maison Carrée, which is considered a fine specimen of Roman architecture and construction.

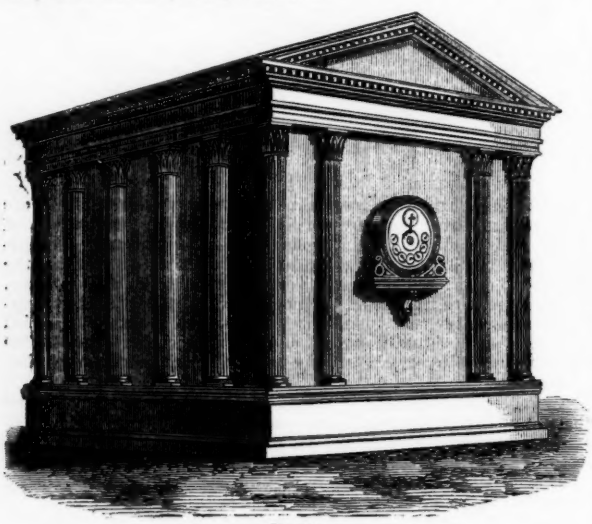


FIG. 9.

Such has been the progress of gas lighting, that many station-meters of the present day equal in dimensions the whole of the retort-house, described by Accum as suitable for supplying a town or city, and the capacity of the wheel is about equal to the storeage mentioned by that author for the same works. Moreover, so general has the use of gas become, that there are many small towns in the United Kingdom where the whole of the capital invested by the company for works, mains, &c., does not exceed the cost of one of these station-meters.

Although the meter-wheel at first sight appears very complicated, yet, considering its functions and its delicacy of action, it is remarkably simple, as will be observed by the accompanying diagrams, which represent the method of "setting out" a meter-wheel. Its diameter, depth, centre opening, and the width of the inlets and outlets being given, by a simple application of geometry, the forms of the various parts composing the wheel are obtained as follows:—

Let us suppose, in fig. 10, the outer circle to represent the cylinder

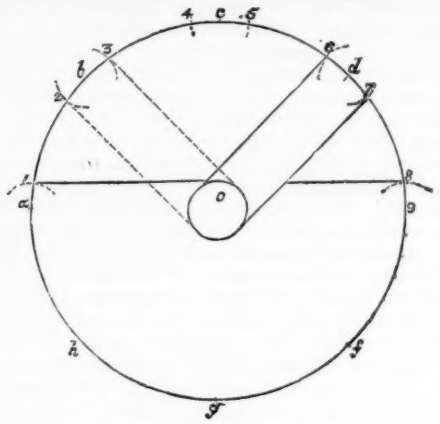


FIG. 10.

of the wheel, and the circle *o* to be the centre opening. First divide the former at eight equal points, at *a*, *b*, *c*, &c., then, with the radius of *o* in the compass, bisect the cylinder at the points marked from 1 to 8 inclusive. Then by drawing a line from 1 to the centre, the position of the inlet of one chamber is obtained, a line from the centre to 8 giving the outlet thereof. The dotted line from 2 to centre gives the front edge of the partition, and the line from 3 to centre the back edge of the same; the line 6 is the front edge of the other partition, and 7 the back. The piece described by the line from 1 to 6, hence to centre, and from there to 1, is the "quarter," of which eight are required for each wheel—four for the front and a like number for the back. One quarter of the wheel being described, the others can be understood; the inlet—for the next chamber—being from 5 to centre, operating as before, and so on for all the rest.

We will further suppose the depth of the chamber to be from *a* to *b*, fig. 11, and the narrow passages adjoining to be the inlet and outlet; then on the straight line describe the radius at the two points as shown, and the distance between them gives the length of the partition. The diagonal line indicates the position of the latter when in the cylinder.

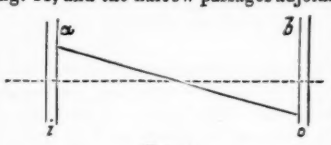


FIG. 11.

Fig. 12 represents one of the partitions. With the radius of *o* in the compass placed in the position of the centre of the axle, a circle is drawn, and a curve from this, to the axle at both sides, gives the capacity of the space for the water to flow into and from each chamber. The part indicated by the dotted line, *s*, at the inlet side, by the hollow cover, can be cut away with advantage, as by this means greater space is given for the passage of the water from chamber to chamber, as the wheel revolves.

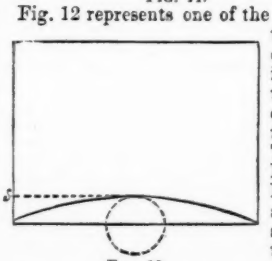


FIG. 12.

The cylinder being constructed, the partitions are placed equidistant in the positions described; the quarters are then placed, which at the same time form the inlets and outlets to the various chambers. The vessel being fixed to its shaft or axle, the hollow cover is attached. The wheel thus constructed is placed in the centre and carefully balanced, so that, when revolving, one part shall not be heavier than another.

The following extracts from Clegg's "Treatise on Gas-Works" give the dimensions of various station-meter wheels:—

Quantity per Revolution in Cubic Feet.	Diameter of Wheel. Ft. In.	Depth of Wheel, minus Hollow Cover. Ft. In.
5·0	2 4	1 $7\frac{1}{8}$
7·5	2 8	1 $10\frac{3}{8}$
10·0	3 0	2 $0\frac{1}{8}$
15·0	3 2	2 $9\frac{1}{4}$
20·0	3 8	2 $8\frac{3}{8}$
30·0	4 1	3 5
45·0	4 7	3 $11\frac{1}{2}$
60·0	5 6	3 $10\frac{1}{2}$
100·0	6 6	5 1
120·0	6 6	5 $9\frac{1}{2}$
150·0	7 2	6 9
200·0	8 10	6 10

It is to be regretted that, when defining the dimensions of the various wheels, a more correct mathematical rule was not adopted as we find in one instance, that of the 150-feet wheel, its depth is almost equal to its diameter, whereas, with the 10-feet wheel, the former is only one-third of the latter. We believe the correct

manner is to make the wheel the same in diameter as in depth, and from the latter to deduct the projection of the hollow cover, which will be one-tenth of the whole depth of wheel.

To the same authority we are indebted for the dimensions of the wheels of consumers meters, as follows:—

Number of Lights	3.	5.	10.	20.	30.	50.	80.	100.
Diameter of wheel . . in.	9·00	12·30*	14·75	17·14	19·47	23·00	24·80	27·55
Depth of wheel. . . . „	4·50	4·90	6·70	9·60	11·00	12·75	17·75	19·20
Diam. of water circle*. „	2·50	3·00	3·45	4·35	5·00	5·90	6·50	7·45
Centre opening. . . . „	1·20	1·70	1·92	2·70	3·03	3·72	4·00	4·90
Project. of hollow cover „	1·06	0·84	1·05	1·00	1·30	1·70	2·05	2·17
Depth of inlet-hoods . „	0·30	0·39	0·57	0.58	0·62	0·95	0·98	1·50
„ outlet „ . „	0·50	0·65	0·90	0·90	1·05	1·20	1·50	1·70
Quantity discharged at each revolution of wheel in feet or parts of a cub. ft.	0·125	0·25	0·50	1·00	1·515	2·50	4·00	5·00

In concluding this subject, we may observe that, considering the simplicity of the construction of the meter, and the important functions it performs; that by it every particle of gas, in passing, is recorded with exactitude during an indefinite period, that its action in no way impedes the flow of gas, or affects the steadiness of the lights; that its work is performed in silence; that it requires little or no attention for months, and even years, except the necessary observations for taking its registration; that, when properly constructed and fairly used, its durability is almost unlimited—we say that, taking all these advantages together, it may be classed among the most beautiful of all mechanical inventions; and, so long as gas is used and measured by it, the names of its inventors—Samuel Clegg, John Malam, and Samuel Crosley—must ever be associated therewith.

(To be continued.)

Correspondence.

PURIFIERS AT THE AIRDRIE GAS-WORKS.

Sir,—In reference to your remarks in the Journal of Feb. 2, on the annual report of the West of Scotland Gas Managers Association, regarding Airdrie, I beg leave to correct a mistake in that report. The area of carbonizing surface (available in our works) should read 358 superficial feet, instead of 58 superficial feet. In comparing the reports on the condensing capacity with other works, I know there is a great discrepancy. Take one, for example, whose condensing capacity is the same as ours in every respect, which appears in the report as being nearly four times larger than ours. Both statements cannot be correct. I would suggest that this subject should be brought up at the first meeting of the association, and a proper understanding come to in making our calculations in the future. As to the working of the purifiers, we differ from our friend in Alloa; we keep the four purifiers always working, except during the time of cleaning, and we clean as soon as possible after the third touches the sulphur test.

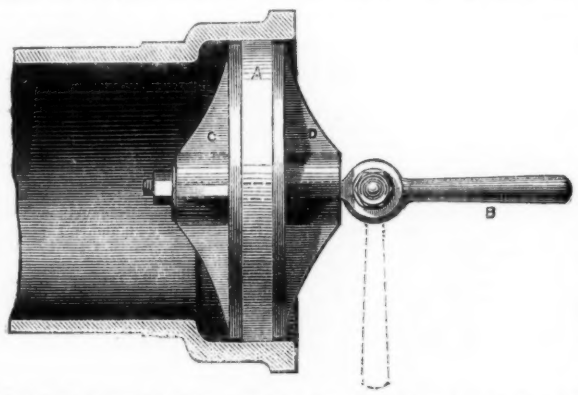
George Niven.

Gas-Works, Airdrie, Feb. 13, 1875.

A SUBSTITUTE FOR THE DRUM-HEAD.

Sir,—Will you allow me to call the attention of your readers to a suggestion for an apparatus to take the place of the old drum-head, or wooden plug, used in laying mains, &c.

The apparatus consists of a disc of rubber, A, which, by bringing the handle, B, into the position dotted, is compressed between the two plates, C and D. The handle, as will be seen, acts by a cam action. When the rubber is compressed, it would close any space that might be round the bolt, and likewise allows some play in fixing, and adapts



itself to slight variations in diameter of pipe. Although it is shown in diagram fixed in a socket end of a pipe, the apparatus is equally applicable to the spigot end. The new arrangement which I propose, I cannot help thinking, seems to possess several advantages on all points over the method at present in use, more especially when the difficulty of bringing the old drum-head, or plug, into action is considered.

South Hackney, Feb. 15, 1875. Edwin Addenbrooke.

VARIATIONS IN THE REGISTRATION OF DRY METERS.

Sir,—Without entering into a discussion with "A Gas Manager," relative to the merits of wet and dry meters, on which so much difference of opinion exists, I think it only fair it should be known, as a set-off against his assertion about dry meters being condemned and "refused to be lent by the most successful gas company in London," that at the present time the largest gas company in London has a contract with two dry meter firms to keep in repair and renew the whole of their stock of dry meters; also, that the second largest gas company in London have, within the last few years, replaced all their wet meters with a well-known maker's dry meters. Both of these large companies have had 25 years experience with dry meters, and have over 100,000 in use—facts which ought to speak for themselves.

C. P.

Feb. 18, 1875.

* Some years ago, Mr. Clegg, through the columns of this Journal, maintained that the water-line was a circle, hence the term above mentioned; but it must be evident to any one that the level of the water cannot possibly assume the circular form.

MR. MANN'S PATENT FOR "SULPHUR" PURIFICATION.

Sir,—I cannot understand why Mr. Patterson is always so anxious to reply to any remarks made in your Journal respecting my patent of 1871 for purifying gas. Is it because his patent for the same object was not taken out till 1872? or is it because I only form one-third of my charge of lime into the sulphide of calcium, whereas he claims to make all the charge of one vessel out of two into this compound? If the latter is the reason, I do not see the cause for anxiety, for my way of working does not require so large a quantity of the sulphide of calcium to be formed as Mr. Patterson speaks of; in fact, it is better not to have it. What I recommend is, that as much of the lime be made into a sulphide as is found in practice to be required. And I also state that the gas should be passed through "hydrate of lime and oxide of iron," in order to remove all impurities except the bisulphide of carbon, before the gas is presented to the alkaline sulphides for the removal of this impurity. In another part of my patent it is also especially enjoined that the carbonic acid and sulphuretted hydrogen be taken out by proper means before the gas is brought to the alkaline sulphides for its final purification; which again means the removal of the bisulphide of carbon. I am, of course, perfectly aware that the whole of the lime in the first purifier I specify is not converted into sulphide of calcium, but my experience has shown that there is sufficient sulphide of calcium to remove bisulphide of carbon, when the purifier is used in the manner I prescribe. Mr. Patterson, in his specification of 1872, says: "When the gas (by processes described in this specification or otherwise) has previously been completely purified from carbonic acid and sulphuretted hydrogen, the contents of the sulphide of calcium purifiers will remain efficient for a long time, seeing that the only 'fouling' element which enters is the small amount of sulphur which exists in the gas in other forms than sulphuretted hydrogen." Just my reason for working as proposed in my patent of 1871.

Again, he says, in the same patent: "After the testings for CO_2 and for SH_2 have been made for a short time, the engineer will be able to ascertain the right mode of working his lime purifiers upon this new principle with sufficient accuracy by simply noting the quantity of gas passing through his purifiers." In my specification it is said that "the quantity of gas to be passed through to effect this conversion—that is, the lime into a sulphide of calcium—may be determined by previous trial." Identically the same thing. The general opinion now is, that the ordinary purifying plant of a gas-work must be supplemented with "carbonate of lime vessels," as well as the "sulphide of calcium vessels;" but I propose to do the carbonating and the sulphuretting in one, and, by a slight modification of the supplemented purifiers, take the gas through the sulphide of calcium only, escaping the inert carbonate of lime entirely, and thereby avoiding the excessive pressure that gives so much trouble where the hydrate of lime processes are used. Although my process was not patented till 1871, the drawings, now in my possession, for the supplementary vessels for such a works as the City of London Gas Company's, were made in 1866, the dimensions of which I shall use for what follows. Take a works having an ordinary purifying power equal to 2¼ millions per day of 24 hours, and supplement it with three (the drawings only show two) vessels having a superficial area of 750 square feet in each tier of sieves, the number of tiers being six. If the lime be taken as five inches in depth, each layer of lime would be equal to about 333 bushels of the hydrate, representing say 166 bushels in the caustic form, which, at 60 lbs. per bushel, would give 4·46 tons as the lime power of each layer, which, multiplied by 6, equals 26·76 tons of lime in such a vessel, making a calcium power of 19·11 tons. Theoretically considered, this quantity of calcium, if combined with its equivalent of sulphur, would become 34·39 tons of calcium sulphide; but, as before stated, two-thirds of the lime will be a carbonate, so that, for purifying the gas (otherwise fully purified) from the bisulphide of carbon, we have 11·46 tons of a reagent for that purpose, and may be represented as the calcium power still remaining in the vessel. Now, as to this power. In theory, 1·055 ton of bisulphide combines with 1 ton of the sulphide of calcium; therefore, 11½ will require 12·13 tons of bisulphide of carbon for complete saturation, which brings me to the quantity of gas necessary to be passed through these 11½ tons of sulphide of calcium, in order to present the required amount of impurity. In my practice, I generally found that gas well purified in the ordinary way contained less than 30 grains of sulphur per 100 cubic feet; but, for the purpose of this communication, I assume 32 grains of sulphur, or, which is the same thing, 38 grains of the bisulphide of carbon vapour, per 100 cubic feet to exist in the gas to be purified. Theoretically, it comes out rather large, but, for the sake of illustration, I will take it as it stands, and put down the quantity as 500,522,100 cubic feet. This is, as you see, assuming that all the bisulphide of carbon is removed; whereas we do not, by the best means in use, get out more than about two-thirds; consequently, in a theoretical point of view, these 11½ tons of sulphide of calcium would reduce the "sulphur" of 800 million cubic feet of gas from 32 to 10 grains.

In conclusion, I beg to say that I do not wish it to be understood that I have any idea of attaining to such perfection as above, but am simply using the theoretical view of the case, to show that one-third, or even one-fourth of the lime charge of such purifiers as most of us have in our mind when on this subject, is a quantity not to be despised when properly applied. It must also be borne in mind that my plan brings the gas to the *sulphide of calcium* with only the *bisulphide of carbon* impurity in it, the volume of which is small compared with the volume of gas bearing it—only about 50 cubic *inches* of the *impurity* per 100 cubic *feet* of the gas to be purified. I am told that my system is like purifying the gas twice over; nevertheless, it looks very much like the right way, and I think the results would justify the means. As it is, I leave it with your practical readers.

W. Mann.

Dorset Street, Blackfriars.

USE AND VALUE OF CARBON.

Sir,—If T. D. H. has a large stock of carbon on hand, had he not better convert it into diamonds by letting ironfounders find their own *dust*, and

turning his attention to the providing of and working an exhauster? Perhaps T. D. H. will say his works are not large enough for an exhauster. I would say that in 1865, when I carbonized about 600 tons of coal for the year, I fixed one, and have never regretted it. I would advise T. D. H. to go and do likewise. H. D. T.

Feb. 18, 1875.

COATING GAS-MAINS.

Sir,—I should suppose that the use of coated gas-mains is more extensive than your correspondent, Mr. Eldridge, appears to be aware of.

I have very rarely laid mains without a coat either of—(*a*) Dr. A. Smith's patent coating, applied externally and internally; or (*b*) of tar and pitch applied externally, when the pipe was heated by steam or otherwise.

The cost is small in both cases; the greatest not being more than about 5*s.* per ton of pipes coated.

The utility of this coating is, of course, affected by the nature of the subsoil through which the mains are laid, but inasmuch as a *good* coating effectually prevents the corrosion of the mains, the value must be obvious to all who have to do with the distribution of gas.

Gas-Works, Carlisle, Feb. 18, 1875. J. Hepworth.

Parliamentary Intelligence.

GAS AND WATER BILLS, 1875.

Monday, Feb. 15.

The examiner sustained the memorial of the Metropolitan Board of Works, alleging omissions in the parliamentary notices of The Gaslight and Coke Company's opposed petition for a bill, and it will be reported accordingly as not in compliance with the Standing Orders.

The consideration of the petition for the Margate Consumers Gas Bill was adjourned to Monday, March 15.

HOUSE OF LORDS.

Monday, Feb. 15.

The following bills were read a second time:—Barrow-in-Furness Corporation; Cardiff Improvement; Greenock Water; Inverness Water and Gas (Purchase, &c.); Inverness Water and Gas (Works, &c.); Stafford District Water.

Tuesday, Feb. 16.

The Lord Chancellor acquainted the House that the Standing Orders applicable to The Gaslight and Coke Company's Bill have not been complied with.

Thursday, Feb. 18.

Petitions against the Cardiff Improvement bill were presented from (1) Marquis of Bute, (2) H. D. A. M. Richards, an infant, by R. O. Jones, her next friend.

The Earl Cadogan gave notice that on Monday, Feb. 22, he would ask "whether it is the intention of Her Majesty's Government to take any steps or introduce any measure, during the present session, with a view to obtaining a better and purer supply of water for the metropolis."

Friday, Feb. 19.

Petitions against the following bills were presented:—Cardiff Improvement, from Lord Tredegar; South Staffordshire Water, from Lord Hatherton; Stafford District Water, from Staffordshire and Worcestershire Canal Navigation Company.

HOUSE OF COMMONS.

Monday, Feb. 15.

The further Standing Orders applicable to the following bills have been complied with:—Kilmarnock Water; Cleethorpes Gas; Carmarthen Gas; Tunbridge Wells Gas; Colchester Gas; Bath Gas; Birmingham and Staffordshire Gas; Worthing Gas; Heckmondwike Gas; Marlborough Gas; Broadstairs Gas; Broadstairs Water (No. 1); British Gas Company (Norwich Station); Maidenhead Water; Portishead District Water.

The petition of The Gaslight and Coke Company for a bill was referred to the Select Committee on Standing Orders.

The following bills were read a second time, and committed:—Ashton-in-Makerfield Local Board; Ashton-under-Lyne, Stalybridge, and Dukinfield (District) Water; Barton, Eccles, Winton, and Monton Local Board of Health; Bradford Water and Improvement; Busby Water; Cleveland (Skelton) Gas; Hamilton Water; Hindley Local Board; Millom Gas and Water; Oldham Corporation Water; Ossett-cum-Gawthorpe Local Board; Oxford (Corporation) Water; Pemberton Local Board; Peterborough Water; Pontefract Borough Extension; Rochdale Improvement; Rotherham Corporation; Southampton Corporation Gas (Purchase, &c.); Stroud Water; Truro Water; Waterford Improvement; Widnes Local Board.

Metropolis Gas (New Works) Bill.—Sir Charles Forster gave notice that on Tuesday, Feb. 16, he would move—"That the order (Feb. 9) for the second reading of the Metropolis Gas (New Works) Bill be read and discharged; that the bill be withdrawn."

Petitions against dispensing with the Standing Orders in the case of the Longwood Gas Bill were presented from (1) Corporation of Huddersfield, (2) Surveyors of Highways for the Hamlet of Old Lindley, (3) Surveyors of Highways for the Township of Stainland, (4) Linthwaite Local Board, (5) Scammarden Local Board, (6) Longwood Local Board.

Petitions against the following bills were presented:—Metropolis Gas (New Works), from Crystal Palace District Gas Company; Metropolis Gas Undertakings (Purchase), from Crystal Palace District Gas Company; Peterborough Water, from Samuel Chatterton; Wakefield Water, from Justices of the Peace of the West Riding of Yorkshire.

Tuesday, Feb. 16.

The Neath District Water, and Worksop Water Bills were read a second time and committed.

Metropolis Gas (New Works) Bill.—On the motion of Sir Charles Forster, the order "that the bill be read a second time," was read and discharged. Bill withdrawn.

The further Standing Order applicable to the Wakefield Water Bill has been complied with.

The report in respect of non-compliance with the Standing Orders, in the case of the petition of The Gaslight and Coke Company for a bill, was referred to the Select Committee on Standing Orders.

The Standing Orders Committee reported:—

"That, in the case of the Longwood gas petition, the Standing Orders ought to be dispensed with. That the parties be permitted to proceed with their bill, provided that the provisions of the Gas-Works Clauses Act, 1847, with respect to the breaking-up of street and bridges, shall not extend to or include any streets or bridges which are not specified in the notices for the bill as being within the proposed limits of supply. That notice of the proposed application to Parliament be given to Jane Kaye and John Taylor. That the committee on the bill do report how far such orders have been complied with on the report of the bill."

"That, in the case of the Phœnix Gaslight and Coke Company petition, the Standing Orders ought not to be dispensed with."

The first resolution was agreed to.

Petitions against the following bills were presented:—Bradford Water and Improvement, from Duke of Devonshire; Broadstairs Water (No. 2), from owners, &c., of property in Broadstairs and St. Peter's (this petition is against the second reading of the bill); Manchester Corporation Water and Improvement, from (1) Samuel Jones, (2) Manchester South Junction and Altrincham Railway Company; Millom Gas and Water, from James Brockbank.

Wednesday, Feb. 17.

The Birmingham (Corporation) Gas, and the Birmingham (Corporation) Water Bills were read a second time, and committed.

A petition for dispensing with the Standing Orders in the petition for the Ballina Improvement Bill was presented from inhabitants, &c., of Ballina and neighbourhood.

Petitions against the following bills were presented:—Birmingham (Corporation) Gas, Birmingham Gas (No. 1), and Birmingham Gas (No. 2), from Birmingham and Staffordshire Gaslight Company; East Northumberland Water, from Anthony Wilkinson; Manchester Corporation Water and Improvement, from Tom Harrop Sidebottom and James Sidebottom; Neath District Water, from Corporation of Aberavon; Newport (Monmouthshire) Gas, from Alexandra (Newport) Dock Company; Wakefield Water, from Frederick Marsden; Waterford Improvement, from Waterford, Dungarvan, and Lismore Railway Company; Pontefract Borough Extension (petitioners not praying to be heard), from ratepayers, &c., of Tanshelf.

Thursday, Feb. 18.

Metropolis Gas Undertakings (Purchase) Bill.

Sir C. Forster stated that the second reading of this bill had been fixed for to-day. Several honourable members had represented to him that it would be inconvenient to take it on that day, and in deference to their wishes he would postpone the second reading until Tuesday, Feb. 23.

The Longwood Gas Bill was read the first time.

The further Standing Order, applicable to the following bills, has been complied with:—Weardale and Shildon Water; Stockton and Middlesbrough Water; Commercial Gas.

Sir Charles Forster gave notice that on Friday, Feb. 19, he will move—"That the order for the second reading of the Galashiels Water Bill be read and discharged; that the bill be withdrawn."

Petitions against dispensing with the Standing Orders in the case of the Ballina Improvement Bill were presented from (1) Earl of Arran, (2) owners, &c., of property in Ballina, (3) Conservators of Fisheries in the Ballina District, (4) Guardians of the Poor in the Ballina District, (5) inhabitants, &c., of Ballina; and in the case of the Chelsea Water Bill, from inhabitants of Thames Ditton, Surbiton, and neighbourhood.

Petitions in favour of the second reading of the Broadstairs Water (No. 2) Bill were presented from ratepayers and inhabitants of Broadstairs and neighbourhood.

Petitions against the following bills were presented:—Bath Gas, from Corporation of Bath; Birmingham and Staffordshire Gas, Birmingham (Corporation) Gas, Birmingham (Corporation) Water, Birmingham Gas (No. 1), Birmingham Gas (No. 2), from Birmingham Water-Works Company; Bradford Water and Improvement, from Aire and Calder Navigation Company; East Northumberland Water, from Martha Steele, Mary Blake, and Nathaniel Grace; Hindley Local Board, from Leeds and Liverpool Canal Company; Oldham Corporation Water, from (1) millowners, &c., on the River Tame, (2) Corporation of Ashton-under-Lyne; Pemberton Local Board, from Leeds and Liverpool Canal Company; Peterborough Water, from Francis Willis; Pontypridd Water, from (1) Ystrad Gas and Water Company, (2) Mordecai Jones; Wakefield Water, from (1) Calder and Hebble, and Aire and Calder Navigation Companies, (2) Edward Armitage and others.

Friday, Feb 19.

The following resolutions were reported from the Standing Orders Committee:—

"That, in the case of the Chelsea Water petition, the Standing Orders ought to be dispensed with. That the parties be permitted to proceed with their bill."

"That, in the case of the Ballina Improvement petition, the Standing Orders ought not to be dispensed with."

The first resolution was agreed to.

A petition for an additional provision in the Longton Gas Bill was referred to the examiners.

The East Northumberland Water, and Manchester Corporation Water and Improvement Bills were read a second time and committed.

On the motion of Sir C. Forster, the order for the second reading of the Galashiels Water Bill was discharged, and the bill withdrawn.

Broadstairs Water (No. 2) Bill.

On the order for the second reading of this bill,

Mr. Goldney moved that the bill be read a second time that day six months. He did so on the ground that Broadstairs had already an ample supply of water, with which the inhabitants were well satisfied, and that the existing company had the requisite powers to increase the supply.

Sir T. Chambers and Mr. Forsyth supported the second reading, pointing out that the quality of the water at present supplied appeared, from official reports, to be unsatisfactory.

After some remarks from Mr. Pemberton in favour of rejecting the bill, and from Mr. Raikes on the other side,

The bill was read a second time.

The additional Standing Order, applicable to the following bills has been complied with:—Birmingham Gas (No. 1); Birmingham Gas (No. 2); Leicester Water; Alford Gas.

Colonel Beresford gave notice that, on the second reading of the Metropolis Gas Undertakings (Purchase) Bill, he will move—"That it be read a second time upon this day six months."

Sir Wyndham Anstruther gave notice that, on Tuesday, Feb. 23, he would move for leave to bring in a bill to enable towns and populous places in Scotland, being burghs under the General Police and Improvement (Scotland) Act, 1862, to erect gas-works for the supply of gas to such towns and populous places, or to acquire existing gas-works therein.

Petitions against the following bills were presented:—Ashton-in-Makerfield Local Board, from Corporation of Liverpool; Barton, Eccles, Winton, and Monton Local Board of Health, from Corporation of Salford; Bath Gas, from Midland Railway Company; Birmingham and Staffordshire Gas, from (1) Manor of Aston and Handsworth Local Boards, (2) Midland Railway Company, (3) inhabitants of Birmingham and neighbourhood, (4) Harborne Local Board), (5) Tipton Local Board; Birmingham Corporation Gas, from (1) Manor of Aston and Handsworth Local Boards, (2) Harborne Local Board, (3) Tipton Local Board; Birmingham Corporation Water, from (1) Manor of Aston and Handsworth Local Boards, (2) Midland Railway Company, (3) Harborne Local Board; Birmingham Gas (No. 1), from (1) Manor of Aston and Handsworth Local Boards, (2) Tipton Local Board; Birmingham Gas (No. 2), from Henry Wright; Black-

burn Water, from (1) Robert Hodgson and John Drysdale, (2) Corporation of Blackburn, (3) Edward Rodgett, (4) Sir Henry de Houghton, Bart., (5) Darwen Paper Mills Company, Limited, (6) Grantham Bridge Paper Company, Limited; Bradford Water and Improvement, from (1) Silsden Local Board, (2) Lancashire and Yorkshire Railway Company, (3) Edward Harland; British Gas Company (Norwich Station), from (1) Bishop of Norwich and Dean and Chapter of Norwich, (2) owners, &c., of property in Norwich; Busby Water, from (1) Mr. Marion Paterson or Armour and others, (2) Duke of Abercorn, (3) Earl of Glasgow and others; Colchester Gas, from Corporation of Colchester; Commercial Gas, from (1) The Gaslight and Coke Company, (2) Metropolitan Board of Works; East Northumberland Water, from (1) Duke of Northumberland, (2) North Shields Water-Works Company, (3) North-Eastern Railway Company; Imperial Gas, from (1) The Gaslight and Coke Company, (2) Metropolitan Board of Works; Leicester Water, from Corporation of Leicester; Longwood Gas, from Corporation of Huddersfield; Metropolis Gas Undertakings (Purchase), from (1) London Gaslight Company, (2) The Gaslight and Coke Company, (3) Whitechapel District Board of Works, (4) Ratcliff Gaslight and Coke Company; Neath District Water, from (1) Governor and Company of Copper Miners in England, (2) Robert Nichol Byass and Company, (3) Great-Western Railway Company, (4) Mary Grant and others; Newport (Monmouthshire) Gas, from Lord Tredegar; Oldham Corporation Water, from (1) Alfred Kershaw Sidebottom and others, (2) Messrs. Butterworth; Oxford Corporation Water, from Conservators of the River Thames; Pemberton Local Board, from Lancashire and Yorkshire Railway Company; Peterborough Water, from Abel Ullett; Pontefract Borough Extension, from (1) Parochial Officers and others of Pontefract Park District, (2) Midland and North-Eastern Railway Companies, (3) Lancashire and Yorkshire Railway Company, (4) Pontefract Gas Company, (5) John Rhodes; Pontypridd Water, from Troedyrhiw Coal Company; Rochdale Improvement, from (1) Oliver Holt, (2) owners of lands in the township of Spotland; Slough Water, from Great Western Railway Company; Stockton and Middlesbrough Water, from (1) North-Eastern Railway Company, (2) Corporation of Middlesborough; Truro Water, from Corporation of Truro; Wakefield Water, from (1) Lancashire and Yorkshire Railway Company, (2) Austonley and other Local Boards; Waterford Improvement, from Waterford Bridge Commissioners; Weardale and Shildon Water, from (1) Auckland District Highway Board (2) North-Eastern Railway Company; Widnes Local Board, from (1) Trustees of Thomas Dutton, deceased, (2) Andrew Barclay Walker.

SATURDAY, FEB. 20.

Petitions against the following bills were presented:—Ashton-in-Makerfield Local Board from (1) Meyrick Bankes, (2) M'Corquodale and others, (3) London and North-Western Railway Company; Barton, Eccles, Winton, and Monton Local Board of Health from London and North-Western Railway Company; Birmingham and Staffordshire Gas from (1) Corporation of Birmingham, (2) London and North-Western and Great Western Railway Companies, (3) Birmingham Canal Company, (4) Oldbury Local Board of Health, (5) Owners, &c, and Consumers in Oldbury, (6) Smethwick Local Board of Health, (7) Owners, &c., and Consumers in Smethwick, (8) Balsall Heath Local Board of Health, (9) Owners, &c., and Consumers in Balsall Heath, (10) Birmingham Gaslight and Coke Company, (11) Consumers of Gas and others, (12) Commissioners and Corporation of Walsall, (3) Ratepayers and Consumers of Gas in Tipton, (14) Proprietors of Iron-Works and large Consumers of Gas in West Bromwich, (15) West Bromwich Improvement Commissioners; Birmingham Corporation Gas, from (1) Midland Railway Company, (2) London and North-Western and Great Western Railway Companies, (3) Birmingam Canal Company, (4) Oldbury Local Board of Health, (5) Owners and Consumers of Gas in Oldbury, (6) Smethwick Local Board of Health, (7) Owners and Consumers of Gas in Smethwick, (8) Balsall Heath Local Board of Health, (9) Owners and Consumers of Gas in Balsall Heath, (10) Birmingham Gaslight and Coke Company, (11) Consumers of Gas and others, (12) Ratepayers and Consumers of Gas in Tipton, (13) West Bromwich Improvement Commissioners, (14) Commissioners and Corporation of Walsall, (15) Proprietors of Iron-Works and large Consumers of Gas in West Bromwich; Birmingham Corporation Water from (1) London and North-Western and Great Western Railway Companies, (2) Birmingham Canal Company, (3) Balsall Heath Local Board of Health, (4) Owners, &c., in Balsall Heath; Birmingham Gas (No. 1) from (1) Corporation of Birmingham, (2) Oldbury Local Board of Health, (3) Owners and Consumers of Gas in Oldbury, (4) Smethwick Local Board of Health, (5) Owners and Consumers of Gas in Smethwick, (6) Balsall Heath Local Board, (7) Owners and Consumers of Gas in Balsall Heath, (8) Walsall Improvement Commissioners, (9) Consumers of Gas and others, (10) West Bromwich Improvement Commissioners; Birmingham Gas (No. 2) from (1) Corporation of Birmingham, (2) Balsall Heath Local Board of Health; Blackburn Water from William Bayne Ranken and Joseph Place; Bradford Water and Improvement from (1) George Smith Taylor and others, (2) Sir Henry J. Tufton, Bart., (3) Great Northern Railway Company; British Gas Company (Norwich Station) from (1) Corporation of Norwich), (2) Trustees of the Great Hospital; Broadstairs Water (No. 1) from Richard Richardson and John Kyme Wright; Broadstairs Water (No. 2) from (1) Broadstairs Water Company, Limited, (2) Owners, &c., in Broadstairs, &c.; Carmarthen Gas from Owners, &c., of Property and Consumers of Gas in Carmarthen; Commercial Gas from (1) Vestry of Mile End Old Town, (2) Poplar District Board of Works, (3) Lee Conservancy Board; Hamilton Water from (1) Alexander Macdonald, (2) Messrs. Colin, Dunlop, and Co., (3) John Watson; Hindley Local Board from (1) Honourable Algernon Egerton, (2) London and North-Western Railway Company; Imperial Gas from Vestry of Saint Mary, Islington; Maidenhead Water from Great Western Railway Company; Manchester Corporation Water and Improvement from (1) Manchester, Sheffield, and Lincolnshire Railway Company, (2) Earl Stamford and Warrington, (3) Denton Local Board of Health, (4) Lord Howard of Glossop; Metropolis Gas Undertakings (Purchase) from (1) Imperial Gaslight and Coke Company, (2) Independent Gaslight and Coke Company, (3) Phœnix Gaslight and Coke Company, (4) South Metropolitan Gaslight and Coke Company, (5) Surrey Consumers Gas Company, (6) Woolwich, Plumstead, and Charlton Consumers Gas Company, (7) Eltham Gaslight and Coke Company, (8) Brentford Gas Company, (9) Wandsworth and Putney Gas Company, (10) Alexander Angus Croll, (11) Commercial Gas Company; Millom Gas and Water from (1) Bootle Union Rural Sanitary Authority, (2) Furness Railway Company; Neath District Water from (1) Glyncorrwg Colliery Company, Limited, (2) South Wales Mineral Railway Company, (3) Corporation of Neath, (4) Edward Acland Morre; Newport (Monmouthshire) Gas from (1) Corporation of Newport, (2) Alexandra (Newport) Dock Company; Oldham Corporation Water from (1) Manchester, Sheffield, and Lincolnshire Railway Company, (2) Earl Stamford and Warrington, (3) London and North-Western Railway Company; Ossett-cum-Gawthorp Local Board from (1) Great Northern Railway Company, (2) London and North-Western Railway Company; Oxford Corporation Water from London and North-Western Railway Company; Pemberton Local Board from (1) Meyrick Bankes, (2) William Widdowes, (3) Samuel Stock, (4) Colonel Blundell, (5) Billinge Local Board, (6) London and North-Western Railway Company, (7) Roger Leigh, (8) Barrow Hæmatite Steel Company, Limited; Peterborough Water from (1) Corporation of Peterborough and others, (2) London and North-Western Railway Company; Pontypridd Water from William Morgan and Great Western Colliery Company, Limited; Rochdale Improvement from William Cayley Worsley; Southampton Corporation Gas (Purchase, &c.) from Southampton Gaslight and Coke Company; Stockton and Middlesbrough Water from (1) Darlington Iron Company, Limited, (2) Tees Conservancy Commissioners, (3) Stockton and Hartlepool Highway Board and others, (4) Corporation of Stockton and South Stockton Local Board, (5) Tees Salmon Fishery Board and others, (6) Alfred Wright Surtees; Tunbridge Wells Gas from (1) South-Eastern Railway Company, (2) Tunbridge Wells Local Board of Health; Wakefield Water from (1) Normanton Local Board of Health, (2) George Bradley and others, (3) Directors of the Holme Reservoir and others, (4) Mortgagees under Holme Reservoirs Act, 1853, (5) Corporations of Dewsbury, Batley, and Heckmondwike, (6) Sir John William Ramsden, Bart., (7) Corporation of Batley, (8) Holme District Local Board, (9) London and North-Western Railway Company; Waterford Improvement from (1) Waterford Gas Company, (2) Burgesses and Grand Jury Ratepayers of Waterford, (3) Marquis of Waterford and Lord Bessborough and others, (4) Owners, &c., and others within the Barony of Kilculliheen, (5) Waterford Harbour Commissioners, (6) Grand Jurors and County Cesspayers of Waterford; Weardale and Shildon Water from (1) Henry Edward Surtees, (2) John Fogg Elliot and George Anthony Lenton Blenkinsopp, (3) Bishop Auckland Local Board; Windes Local Board from London and North-Western Railway Company.

Legal Intelligence.

COURT OF CHANCERY.—THURSDAY, FEB. 18.
(*Before Vice-Chancellor* MALINS.)

FOREIGN AND COLONIAL GAS COMPANY, LIMITED.

Mr. MONTAGUE COOKSON moved in this case, on the part of the official liquidator that an order made on the 21st of January last might be discharged, or that the drawing up of the order might be stayed until further order, or, in the alternative, that Mr. Bower, who obtained that order, might pay the costs.

The facts were that the Foreign and Colonial Gas Company were ordered to be wound up on the 10th of December last, and four days after Mr. Bower, who had a suit at the Rolls pending, served a notice of motion for liberty to proceed with that suit. No official liquidator had at that time been appointed, and the notice was served on a former solicitor of the company who had ceased to be so. Therefore that solicitor, by counsel, appeared and informed the court of the fact that he had ceased to be solicitor. The official liquidator desired to state the facts to the court, the order having been obtained behind his back.

The VICE-CHANCELLOR inquired why the official liquidator was not served.

Mr. BRADFORD (with Mr. GLASSE, Q.C.) said no official liquidator had been appointed at the time, and the present motion was, in fact, the motion of a promoter.

The VICE-CHANCELLOR said the proper course was to stay the drawing up of the order, and the official liquidator must be heard upon it. All the costs would be dealt with when the motion was heard.

(*Before Vice-Chancellor* HALL.)

THE ATTORNEY-GENERAL *v.* THE MAYOR AND CORPORATION OF PETERBOROUGH.

This was a motion, upon information filed by the Attorney-General, upon the relation of ratepayers and owners of property at Peterborough, to restrain the application of the borough funds in opposing a bill in Parliament which had been introduced by the existing water-works company for affording a new supply of water to the town. It appeared that at a meeting of the inhabitants held in January, at which the mayor presided, a resolution was passed authorizing the corporation to oppose the measure. Mr. Groves, the solicitor of the bill, residing in Peterborough, then demanded a poll of the ratepayers upon the question, which was refused by the mayor on the ground that the demand was made too late, no opposition having been offered to the passing of the resolution.

Mr. LINDLEY, Q.C., and Mr. ROBINSON now moved to restrain any proceedings by the corporation in Parliament, at the expense of the borough, until the poll required had been taken.

Mr. DICKINSON, Q.C., and Mr. EVERITT appeared for the corporation, and offered no opposition to a suggestion of the Vice-Chancellor that the poll should be taken, stipulating, however, that the relators should undertake to abide by any order the court might make should the poll be against them.

The matter accordingly stood over, upon mutual undertakings to the above effect, and that the corporation should not in the meantime proceed upon their petition in Parliament.

COURT OF QUEEN'S BENCH, DUBLIN.—FRIDAY, FEB. 19.
(*Before Justice* BARRY *and a Special Jury.*)

CLEMINSHAW *v.* THE CORPORATION OF DUBLIN.

Mr. GAMBLE, Q.C., Mr. PORTER, Q.C., and Mr. BYRNE appeared for the plaintiff; Serjeant ARMSTRONG and Mr. CORTON for the defendants.

Mr. GAMBLE, in stating the case, said the plaintiff was a gas engineer, and that the action was brought to recover £513 8s. for services rendered to the corporation of Dublin. The plaintiff was employed to inquire into the supplying of the city of Dublin with gas, both as to the expense of the supply in the past, and the arrangements necessary for the future, and especially in reference to a proposal that had been made by the Alliance Gas Company in the year 1873 to sell their entire undertaking to the Corporation of Dublin. Formerly the Commissioners for Paving and Lighting, and afterwards the Corporation, were charged with the duty of lighting the city, and by the Dublin Improvement Act of 1849, s. 63, the Town Council had the duty imposed upon them of lighting the borough. This duty they might perform either by becoming themselves the manufacturers and suppliers of gas, or by contracting with a company for the purpose, and out of this duty to light the city in some way the necessity for employing the plaintiff arose. Prior to the year 1866 the city had been lighted under an agreement between the corporation and different gas companies, but in that year these companies were amalgamated by Act of Parliament, and a new agreement with the corporation was sanctioned by that Act. Under the agreement the united company, the Alliance and Dublin Consumers Gas Company, agreed to light the city for ten years up to the 4th of January, 1877, at the price of 3s. 11d. per 1000 feet of gas, including the supply of lamps, pipes, and meters. The corporation had thus a very good bargain, for the net price of the gas so supplied was not more than 2s. 6d. per 1000 feet, while the price to private consumers was 4s. 6d. per 1000 feet. But that contract was about to expire at the end of 1876, and at the termination of the agreement they would be bound to light the city at the lowest price charged to private consumers, and to sell the lamp-posts at a price to be fixed by arbitration. The position of the corporation, then, at the end of 1872 was that they were bound under the Act of 1849 to light the city; the contract would expire at the end of 1876, and then they would be obliged either to pay the company 5s. per 1000 feet, instead of 2s. 6d., or provide new works, mains, and pipes, in order to manufacture gas. They therefore directed their own gas inspector, Mr. Cotton, to inquire into the whole position of the affair and report to them. He did so, recommending the purchase of the gas undertaking, and stating in the strongest terms the necessity for the immediate action of the corporation. The Town Council met on the 26th of October, 1872, and appointed a Gas Committee, and directed the necessary steps to be taken for promoting a bill in Parliament. This committee opened a negotiation with the Alliance Gas Company, and they ultimately settled the heads of an agreement. The corporation afterwards asked the aid of the Chamber of Commerce, and ten eminent citizens named by them were

added to the Gas Committee to aid and advise in the negotiations. On the 16th of January, 1873, this committee, seeing that the matter was one of great magnitude and great difficulty, passed a resolution to employ two eminent engineers to examine and value the works of the Alliance Company, to inquire into the state of the works, the mains and pipes, to go into the whole question of profit and loss, and advise the corporation as to the advantage or otherwise of the proposed purchase. The plaintiff was named in that resolution as one of the engineers to be consulted. Another engineer, Mr. King, was also named, but he did not act, and a Mr. Pritchard was appointed in his stead. This resolution was communicated to the plaintiff, and he undertook the work, for which he now sought to be paid. The plaintiff came over from England on the 25th of January, and on the 27th was handed a code of instruction of the most complete and formal character, imposing on him a very laborious examination, requiring great professional skill and care. For this work his charge was £10 10s. a day, with a small sum for clerks expenses. Subsequently plaintiff had to prepare evidence for the committee of the House of Commons. The report of the plaintiff and Mr. Pritchard was laid before the corporation at the end of February, 1873. They adopted it, acted on it, and, fortified by that report, they affixed the corporation seal to the agreement with the gas company, one of the clauses of which provided for the payment out of the corporation funds of all expenses connected with the agreement. Under these circumstances, it was unreasonable for the corporation now to resist payment.

The officer of the corporation was then examined, and produced the books containing the resolutions of the Gas Committee and of the corporation, and stated and proved that the corporation seal had been affixed to the petition to the bill and to the agreement with the gas company. This agreement was read and contained a clause that the corporation should bear all expenses of procuring the bill.

Mr. *Cleminshaw* was examined by Mr. GAMBLE, and deposed to the time expended, and that the charges were reasonable, and the same as he had been paid in Belfast and elsewhere.

Mr. *Cotton*, secretary to the Gas Committee, was examined, and proved that the letters he had written to the plaintiff were written by direction of the Gas Committee of the Town Council.

Serjeant ARMSTRONG, on behalf of the corporation, submitted that there was no employment of the plaintiff under the seal of the corporation, and that the work of applying to Parliament for an Act increasing their powers was *ultra vires* the scope of their authority. The corporation did not deny that the work had been done, nor that the plaintiff had been appointed; but last year similar charges were paid by the corporation, and were surcharged by the auditor against those who had signed the cheques, and, although an appeal was made to the Local Government Board, the decision of auditor was upheld, and the corporation were anxious now to have the judgment of the court as to their liability.

Mr. GAMBLE submitted that the affixing the seal of the corporation to the petition for the bill and to the agreement with the gas company, and the sending to the plaintiff of the resolutions directing this to be done, was a sufficient employment under seal if it was needed; and, secondly, that the subsequent adoption of the plaintiff's report, and acting on it, and using his work with regard to a duty which they had to perform—viz., the lighting of the city, was sufficient of itself to sustain the action. As to the agreement with the gas company, he submitted that, as the corporation were bound to light the city, it was entirely within the scope of their authority to take all steps necessary for a renewal of the agreement with the company or taking up the works themselves.

His LORDSHIP said that the plaintiff had been employed, and was entitled to be paid; that the corporation seemed to have been only doing what was necessary to enable them to light the city as they were bonnd to do, and that as the corporation had affixed their seal to the petition for the bill and to the agreement, it would be difficult for them to escape liability. They were, however, perfectly justified in bringing the matter before the court, and submitting it to a jury as to the amount.

The defendents did not go into evidence, but asked a direction for a nonsuit.

His LORDSHIP, in charging the jury, directed them to find for the plaintiff, leaving them to fix the amount to which they would consider the plaintiff entitled. His own opinion was that the proceedings with regard to the gas questions were *boná fide* undertaken by the corporation; and it was to be regretted that they had fallen through. Because, judging by the magnificent water scheme which had been given to Dublin, through the exertions of the corporation and some of its best members—a water supply of the purest kind, and one of the greatest sanitary blessings that had ever been conferred upon the citizens, there was every reason to suppose, he said, that from the manner in which this had been accomplished, it would have been for the benefit of the citizens—that the corporation had obtained the management of the gas undertaking also. The corporation, had they succeeded, would have been likely, at any rate, to give the people better light than the hazy glimmer by which at present one was hardly able to pick his steps out of she way of a coal cart.

The jury found for the plaintiff for the full amount claimed.

WARRINGTON POLICE COURT.—FRIDAY, FEB. 5.

(*Before Mr.* NEILD, *Chairman, and Captain* REYNOLDS.)

PROSECUTION OF GAS STOKERS.

Thomas Woods, John Devine, John Cunningham, Edward Stevens, Charles Fester, and *Thomas Ashton*, servants of the Warrington Gas Company, were summoned for breach of contract by neglecting and refusing to work on the 1st of February, and so doing damage in each case to the extent of 15s. Cunningham did not appear, and a warrant was issued for his apprehension.

Mr. BUCKTON prosecuted on behalf of the gas company, and submitted written contracts made between the company and Woods, Stevens, and Ashton, in which it was stated that a fortnight's notice should be given or taken. There was, however, a proviso to the agreement, which stated that providing there is negligence or misconduct on the part of the *employés*, the company shall have power to dismiss them.

Mr. *Paterson*, the manager, stated that the defendants absented themselves from their work on the 1st inst., without having given him any notice of their intention to do so. They came to the works at eleven o'clock in the morning of the day named, and declined to work unless he would break the rules of the works, and let them come and go to their work when they pleased. They had not worked since. By the defendants absence the manufacture of gas was suspended. Each man had ten retorts to take charge of and two fires. When absent from their duties the retorts stand idle, the furnaces go down, and the retorts go to pieces. For two or three days there is a leakage of gas from the retorts, and the working is destroyed. The loss of gas is really very serious, and if the whole of the stokers, 32 in number, were absent, the town would be in total darkness.

Other evidence having been given in substantiation of the foregoing statements, it was urged on behalf of the defendants that the reason they declined to work was because they had already lost a half-day's pay, and they would be fined for not attending at the regular time.

The *defendants* were called, and they stated that there was no combination to inconvenience the company. They had known previous occasions when five men had stayed off, and the work had been done by the other men. The threat to fine them led them to leave the work, as there was no rule in the works which empowered the company to fine them.

The defendants were each fined 15s., the damage, and the loss of their wages for the part of the week they had worked, and the contract between them and the company was annulled.

Miscellaneous News.

METROPOLIS GAS SUPPLY.

METROPOLITAN BOARD OF WORKS.

WITHDRAWAL OF THE NEW WORKS BILL.

The usual Weekly Meeting of the Board was held on Friday last—Sir JAMES HOGG, M.P., in the chair.

A memorial was presented from the vestry of St. Giles, Camberwell, stating that at their meeting, on the 17th inst., they had had under consideration the two bills promoted by the Metropolitan Board, in conjunction with the City Corporation, the one for purchasing the undertakings of the gas companies, and the other regulating the supply of gas by those companies. The parish of St. Giles, with the exception of a small portion thereof, was supplied by the South Metropolitan Gas Company, which company, by reason of their small capital and good management, had been able for many years to supply gas of 14 candle illuminating power at the low price of 3s. per 1000 cubic feet, and with no charge for the use of meters, and had supplied 1950 public lamps in the parish at the yearly cost of £4 5s. 6d. each, with a reduction of 7½ per cent. if the same were paid for within a month. A very small portion of the parish was lighted by the Phœnix Company, who, by reason of their large capital and heavy working expenses, were obliged to charge as much as 4s. 2d. to 4s. 6d. to the private consumers, and £4 15s. each per annum for the public lamps. In 1872 a bill was promoted by these companies for an amalgamation, and the memorialists, at a considerable expense, opposed that bill in the House of Commons, as it was believed that the amalgamation, if carried out, would be a great injustice to the parish, as it would entail an increase of price to the consumers. The memorialists were informed that there was a clause in the Regulation Bill, promoted by the board, under which the price now charged by the South Metropolitan Company would be retained; and the vestry, therefore, while thanking the board for inserting that clause, requested them, by every means in their power, to secure to the parishioners the advantages they at present enjoyed, and to prevent an increase in the price of gas. They expressed a hope also that the board would maintain in their integrity those clauses by which the dividends of all the companies were limited to 10 per cent., any surplus profits being devoted to a reduction in the price of gas.

Mr. DRESSER ROGERS moved that the memorial be sent to the Parliamentary Committee. The proposed legislation in reference to the supply of gas was a question which seriously interested the parish of Camberwell. Last Wednesday a long debate took place in the vestry on the bills promoted by the board, and, though there was at first a feeling on the part of a few members that the vestry ought to obtain a *locus standi*, for the purpose of opposing the board, the general feeling, after an animated discussion, was that they should not place any impediment in the way of the board. They, therefore, determined only to send the memorial just read, begging the board to do all that they could to maintain the present advantages enjoyed by the parish.

The motion was put and agreed to.

The Parliamentary Committee presented a report, in which they stated that they had proceeded, upon the reference to them on the 5th inst., to prepare a bill for the regulation of the metropolitan gas companies. The committee had caused such bill to be prepared, and they now submitted the same to the board, and recommended that the chairman be requested to introduce the bill into the House of Commons. The bill was framed upon the suggestions contained in the committee's report, presented on the 5th inst., except in one particular—viz., the 10th condition, which required that all new capital henceforth to be raised should be raised by debenture stock, bearing interest of not more than 5 per cent. per annum, or, if by share capital entitled to 10 per cent. dividend, such share capital should be put up to public tender, and allotted to the highest bidder. The draftsman employed by the committee informed them that the notice for the bill did not cover such a provision. The committee had also to report that, acting on the resolution of the board of the 12th inst., they had, in accordance with the advice of counsel, authorized the withdrawal of the bill for the establishment by the board of new gas-works. This course had been agreed to by Mr. Corrie, the Remembrancer, on behalf of the corporation.

Mr. NEWTON, in moving the adoption of the report, said the bill was now in the hands of members, who would see that it was based strictly on the regulations adopted by the board a fortnight ago, the only alteration being that stated by the committee. The parliamentary draftsman advised that the 10th clause of the regulations could not be incorporated in the present bill, because, as it related to the mode of raising capital, there had been a non-compliance with the Standing Orders. He (Mr. Newton) presumed, however, that it would be quite competent to the board, if it should be desired to press that point, to ask the House of Commons to insert such a clause in committee. In other respects, the bill carried out as fully as possible the regulations decided upon by the board a fortnight ago, and under those circumstances he did not think it necessary to offer any further observations.

The CHAIRMAN at once rose and put the question.

Sir W. CODRINGTON said he hoped the board were not going to carry the proposal in so great a hurry—almost, as it were, in a moment. He wished to bring to the attention of the Parliamentary Committee that, under the existing law, consumers complained that the maximum dividend of 10 per cent., which had been given to the companies, had been the means of exacting a minimum dividend at that rate. The companies, in fact, called 10 per cent. their "statutory dividend;" and he found in the present bill a somewhat similar term was employed. It was all very well to say the companies were limited by the bill to a price of 3s. 9d., and that referees instead of commissioners were appointed; but he wanted to know this—supposing the price of gas was to go below 3s. 9d., what dividends were the companies to have?

A MEMBER: They will want to have more than 10 per cent.

The CHAIRMAN: I must point out to the honourable member that this bill has been prepared in accordance with the orders of the board.

Sir W. CODRINGTON: I remember on the last occasion asking whether the board were to be considered bound, by the adoption of the regulations, to every clause in the bill when it came up, and I then understood there would be an opportunity to discuss the clauses at that time.

The CHAIRMAN: I must point out to the honourable member that the question he is raising now has been decided already in favour of the principle adopted in the bill.

Sir W. CODRINGTON: Of course I bow at once, if there is to be no discussion of the bill.

The CHAIRMAN: On an important question like this, I do not rule that you cannot say anything at all. At the same time I may remark that every one of these clauses has been discussed, and I think it will be somewhat irregular to go over them again. The question now to be decided is, whether the chairman shall introduce the bill into the House of Commons. The whole of the principles embodied in the bill have been already discussed, and I do not think we can again go through the clauses.

Sir W. CODRINGTON: I have nothing further to say, except to raise my objection to the defect of the bill in this matter.

Mr. LESLIE: This bill is intended to amend the Metropolis Gas Act, 1860, and to repeal the City of London Gas Act, 1868. I only received the draft of this bill the night before last, and yet we are called upon to-day to approve of its provisions, and to instruct the chairman to bring it into the House of Commons. This bill repeals all the important clauses of the Act of 1860, which

cost the metropolis £20,000, and though it repeals entirely the Act of 1868, it reintroduces all the obnoxious features of that measure. Now I do not think we have had time to consider a matter of so much importance to the public, and I will just refer to one or two points which demand attention. Many of the gas companies of the metropolis are under the Act of 1860, and they are compelled to supply a certain illuminating power, tested in a particular way, and they are compelled to supply gas of such purity that there shall be in it not more than 20 grains of sulphur, in any form, per 100 cubic feet. This bill repeals all that, and you propose to give it into the hands of what I call "the cock and pie chemists," who may be in favour of a greater quantity of sulphur in gas. The referees, under the Act of 1868, are allowing 5 more grains at this moment than the Act of 1860 prescribes, although, as a matter of fact, a large portion of the public are being supplied with gas having less than half that quantity. Now, do you consider that we are, off-hand, prepared to assent to the introduction by the board of a bill which will do a larger amount of mischief than was ever done by the gas companies of the metropolis? Having contested for some years, and having successfully contested, this sulphur question, I should be extremely sorry that the board should sanction an increased quantity of sulphur impurity by adopting the bill submitted to us to-day—a bill which is to repeal the most valuable portions of the Metropolis Gas Act which now exist in the interest of the consumers, and to substitute others diametrically opposed to them. I am sorry to have to speak again on this gas question, but I think it my duty to point out to the board the mischief they are going to do if they adopt this draft. The whole of the metropolis will be up in arms against you as soon as it becomes known. I say that, according to the evidence of your own officer, and of the officer of the City of London, the amount of sulphur impurity in gas can be much reduced below 20 grains—in fact, The Gaslight and Coke Company are now sending out gas with far less in it. This is another instance of what I call crude legislation upon a subject of which, with all respect, I say you understand nothing. Then you are going to approve of amalgamation by this scheme. I can only say that, of all the mischievous interferences of the board against the interests of the ratepayers, this is about the worst I have ever known, and you have done a great deal of mischief, too.

Mr. RUNTZ: Most of us think that the work in which we are engaged in connexion with this regulation bill is the best that we could undertake for the consumers. With reference to the sulphur impurities, I should be sorry to leave them as they are under the Act of 1860, at 20 grains, because I believe it is possible to go much below that. By this bill it will be in the power of the referees to fix a much lower standard. As to the question of amalgamation, that will be of no consequence, provided we carry this bill, especially the 5th clause, which makes the dividends of the shareholders dependent upon the price charged for gas. The maximum is to be 3s. 9d., and for every 1d. charged above that the companies are to reduce their rate of dividend a quarter per cent.

Sir W. CODRINGTON: If the price goes lower——

Mr. RUNTZ: Then, I suppose, some will argue that the companies should get more dividend; but we have nothing to do with that. We only go as far as this—we say you shall charge no more than 3s. 9d., with a guaranteed dividend of 10 per cent.

Mr. RICHARDSON: Not guaranteed.

Mr. RUNTZ: A maximum dividend; and we think that, if this bill becomes law, economy will be the great motive on the part of the gas companies, and that is the best thing for the consumers. I feel that this is the best course to pursue to settle the long vexed question, and I hope the bill will become law.

Mr. NEWTON: I think no complaint should be made of a want of time to consider the bill, because the suggestions upon which it is based were fully discussed a fortnight ago. If you will remember, there were one or two things a little in dispute, as to whether our intentions were made sufficiently clear by the way in which some of the clauses were worded. Mr. Fowler, Mr. Selway, and Mr. Rogers being interested in the supply of gas by a particular company over the water, whose price is very low, were doubtful whether the suggestions were sufficiently definite to secure the maintenance of that price in their district. This bill has been in their hands for two days, and they have had the opportunity of looking through the clauses. As they do not raise any objections on this occasion, I presume the clauses satisfy them. I think the discussion here to-day should be whether the decision of the board on a former occasion ought to be fully carried out; and as Sir William Codrington discussed the question which he now raises at that time, he should be content without attempting to revive it now. It is rather unfortunate we cannot succeed in convincing him that when we use the term "maximum" we do not guarantee it also as a "minimum." It is proposed, as Mr. Runtz says, that the companies shall have 10 per cent. so long as they can earn it at 3s. 9d.; and that if they cannot do so, and are obliged to increase their price, they must submit to a corresponding reduction in the rate of their dividend. This dividend is the "maximum," because it can never be higher. We have been cautioned that we are upsetting the legislation of past years for the worse—that we shall find ourselves in a mess; and we are told that we are perfectly ignorant of this question, and ought not to be entrusted with the initiation of any legislation upon it. But there has not been a single reason for these statements.

Mr. LESLIE: I think there was very good reason given.

Mr. NEWTON: It was simply a piece of declamation, in which there was only "sound and fury, signifying nothing." It is quite clear, however, that we have never been able to gain a single particle of experience from anything Mr. Leslie has ever told us, and if, after all his information, we are still ignorant, I am afraid we shall remain so. We have been discussing this matter for six months; we have turned it over on all sides, and we have come to the conclusion that this regulation bill will be a panacea for almost all the evils we have long complained of in respect to the gas supply. I say now, as I said from the first, that if such a bill is passed, I shall be perfectly satisfied to leave the manufacture and supply of gas in the hands of the present proprietors, feeling certain that the interests of the shareholders will, in future, be identified with the interests of the consumers, and that the companies will carry on the manufacture and distribution of gas to the best advantage.

The motion was then put, and carried with two dissentients.

The CLERK read a further report from the Parliamentary Committee, recommending that petitions be presented against the Chelsea Water-Works Bill, the Commercial Gas Company's Bill, the Imperial Gas Bill, and the Bill of The Gaslight and Coke Company. The committee reported that the Phœnix Gas Company's Bill cannot be proceeded with on account of the Standing Orders not having been complied with.

Mr. NEWTON, in moving the adoption of the report, said the committee had been carefully through the bills which they recommended should be petitioned against. The object of the petitions was to obtain *locus standi*, but no counsel would be employed to oppose the bills without further instructions from the board.

Mr. LESLIE asked what had become of the second statement in the first part of the committee's report, as to the withdrawal of the New Works Bill of the board.

The CHAIRMAN said the board had adopted that portion of the report.

Mr. LESLIE: Then am I to gather that the bill for enabling the board to establish new gas-works for the whole of the metropolis is withdrawn? Why, sir, I advised you to take that course months ago.

The CHAIRMAN: The question now before the board is about other bills.

Mr. LESLIE: Am I to understand that the board have agreed, without a word being said, to the withdrawal of the New Works Bill?

The CHAIRMAN: Both parts of the report were read by the clerk at the table, and a motion was made to agree with the committee, and it was carried. Mr. Newton is now moving the third part of the report, respecting other bills.

Mr. LESLIE: Then I will ask the question of the solicitor. Is the bill for the purpose of authorizing this board to erect gas-works for the whole metropolis withdrawn?

Mr. SMITH: The Parliamentary Committee have reported upon it.

Mr. LESLIE: Is it withdrawn?

Mr. SMITH: I do not know whether the board wish me to answer the question. (No, no.)

Mr. LESLIE: Then it is withdrawn without the consent of the board being given. (Order, order.)

The motion was put and carried.

ISLINGTON.—At the meeting of the vestry of this parish on Friday evening last—Mr. Savage (member of the Metropolitan Board of Works) in the chair—a report was brought up from the General Purposes Committee on the Metropolitan Board gas bills, in which the committee expressed a very decided opinion that it would be very imprudent to permit such destruction of the streets and highways as was contemplated by the Metropolis Gas (New Works) Bill, or to authorize the expense which would be incurred by the creation of works adequate to supply gas over the area now occupied by the several gas companies, but they did not object to the Metropolis Gas Undertakings Purchase Bill on any other grounds than that it is extremely doubtful whether the Board of Works could manage the supply of gas better than was done by the existing companies. Mr. Reddish moved the adoption of the report; to which an amendment was moved by Mr. Edman, approving the action of the board. Mr. Mirams thought there was no use in discussing the question. No resolution of theirs would have any avail or weight with the Metropolitan Board of Works, the petitions of their constituents not being regarded by that body. Speaking in a homely though expressive manner, he thought that if the Metropolitan Board purchased the gas companies they would be getting out of the frying-pan into the fire. The Metropolitan Board of Works were not constituted for the purpose of supplying gas to the metropolis. Mr. Bradfield said that buying up the gas companies would involve expending a large amount in giving superannuations to the discharged officers, as compensation would be required. He doubted whether 17 millions would cover the cost of purchasing the companies. The Metropolitan Board had pledged the metropolis already to 15 millions, and adding to this 17 millions where would they be? They would be strengthening the hands of the opposition by communicating with their members of Parliament to oppose the bill. Mr. Eit (himself a member of the Metropolitan Board) said the majority of the members had very little hope of carrying the bill. Mr. Price deprecated the policy of the Metropolitan Board in promoting bills and then withdrawing them, as money was thus wasted in drafting and printing. The amendment approving of the action of the board was then negatived, and the original motion, to which a rider was attached—"That the borough and county members be requested to oppose these bills in Parliament," was put and carried.

Dr. Whitmore's report on the illuminating power, pressure, and quality of the coal gas consumed in the parish of Marylebone during January:—

1875.	Illuminating Power in Sperm Candles.			Mean Pressure in Tenths of an Inch.		Mean Quanty. of Sulphur in 100 Cu. Ft.	Mean Quanty. of Ammon. in 100 Cu. Ft.	Sulphuretted Hydrogn.
	*Mean of 24 Obser.	High-est.	Low-est.	High-est.	Low-est.	Grains.	Grains.	
Imperial Comp.'s gas	16·55	17·74	15·60	26·27	8·93	24·67	0·90	No trace
Chartered Company's common gas	16·74	17·31	15·54	23·92	10·6	16·50	0·93	No trace
Chartered Company's cannel gas	22·56	24·01	20·04	17·07	9·00	2·93	0·73	No trace

Mean of daily readings of barometer . . . 29·74
" " " thermometer . . . 56·36

* Each observation consists of ten readings of the photometer, at intervals of one minute.

During the month the mean illuminating power of the Imperial gas was equal to the light of 16½ sperm candles; it ranged between 15 and 17·74 candles. The mean quantity of sulphur in 100 cubic feet of the gas was 24·67 grains, and of ammonia nine-tenths of a grain. The mean light of the Chartered common gas equalled nearly 17 candles, and ranged between 15·54 and 17·31 candles. Six times it exceeded 17 candles, and twice only was it below the legal standard. The mean amount of sulphur was 16·50 grains, and of ammonia not quite one grain. The cannel gas gave a mean light equal to 22½ candles; it ranged between 20 and 24 candles; on no occasion did it fall below the standard. The mean quantity of sulphur was 21·93 grains, and of ammonia three-fourths of a grain. The pressure of all the gases was good, much better than in the previous month, and on no occasion was sulphuretted hydrogen detected by the ordinary tests. The above results were obtained from the gas manufactured by the Imperial Company at their Fulham works, and from the Chartered Company's gas manufactured at their works, Beckton and Bow.

METROPOLIS WATER SUPPLY.

Dr. Whitmore's report on the composition of the Thames companies and other waters supplied in St. Marylebone during January:—

1875.	Total Solid Matter in degrees or grains per Imperial gallon.		* Loss by incineration of Solid Matter in previous column.		Hardness before boiling in degrees.	Hardness after boiling in degrees.
	Jan., 1874. 0°	Jan., 1875. 0°	Jan., 1874. 0°	Jan., 1875. 0°	0°	0°
Distilled Water . . .						
West Middlesex water .	20·76	21·72	0·84	0·92	14·59	3·09
Grand Junction water .	20·96	22·24	0·96	1·04	14·90	4·11

* The loss by incineration represents the amount of organic and other volatile matters contained in an Imperial gallon (70,000 grains) of water.

The water supplied to the parish during the month was generally bright, and well filtered, and having regard to the amount of rainfall, which always contributes to render the Thames water more or less turbid, its condition indicated that the system of filtration adopted by both companies was very satisfactory.

CHELSEA WATER COMPANY'S BILL.—At the meeting of the Metropolitan Board on Friday last, Sir W. Codrington asked whether the Chelsea Water Company were bound to submit plans of their new works for the consideration of the board. He thought it was very essential to the inhabitants of the district that they should know what those plans were. The solicitor (Mr. Smith) said the works to be authorized by the bill were beyond the juriadiction of the board, and therefore there was no obligation upon the company, but there was no doubt they would furnish copies of the plans if applied to.

NEW PROCESSES IN PROXIMATE GAS ANALYSIS.

By Henry Wurtz, of New York.

[Communicated in part, with Experimental Illustrations, to the "American Gaslight Association," Oct. 22, 1874, and forwarded to this Journal, with emendations, by the Author.]

(*Continued from page* 220.)

IV.—Of the General Manipulations with Purified Coal Gas.

Fig. 4 represents a very complete train for this purpose. As the suspended matter here is absent, or trifling in amount, and the ammonia usually very small, A represents a combined arrangement for taking up both these. The first or right-hand U-tube is loosely filled with cotton, the second one with granular bisulphate. E contains two slips of turmeric and red litmus papers, to verify the perfect efficiency of the bisulphate. F contains granulated cupric-sulphate crystals. G is CaCl. H is sodic hydrate, with a small CaCl tube appended. The arrangement KL, for determining oxygen, requires special explanation. K contains glass beads or broken-up glass rod, wet with a concentrated solution of pyrogallol in previously boiled water. L contains CaCl. As, in order that the pyrogallol should take up the oxygen, there must be an alkali present, the following special course is adopted for preparing KL for initial weighing and introduction into the train. K is immersed, L being detached for the time, in snow and salt; and connected with a flask like C in fig. 1, containing some of the strongest liquid ammonia. A current of common street gas is then directed first into the ammonia flask, then through K. The former is warmed, and the gas, as it issues from the latter, lighted The point of saturation of the contents of K with NH_3 will be indicated by a change in the character of the flame. The ammonia flask is then detached, K being simultaneously—to prevent ingress of air—attached to J, L replaced, and the whole put in position.

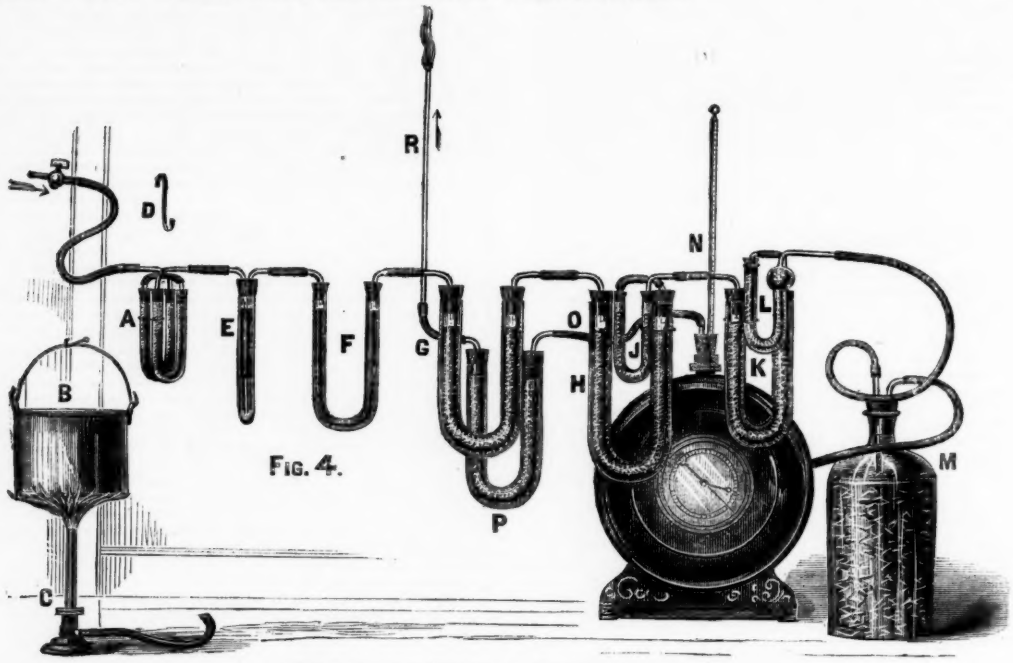


Fig. 4.

Train for the Analysis of Purified Coal Gas, &c.

A, in connexion with E, is also dried out before initial weighing of the former, by a current from the preparatory train; this operation being greatly accelerated in this case by immersion of A in the boiling water in B, which is raised up and hung for this purpose on the little wire pothook, D. It is to be observed that the two tubes in A are weighed separately, and not together; and, to avoid hygroscopic moisture, cooled and enclosed while weighing, in close boxes of sheet brass or tin. The members of this train, G, H, and P, require no preparatory desiccation before weighing.

With reference to the tube F a special remark should be made. The *hygrometric* equilibria of the cupric sulphate in the aërial and gaseous media respectively, may appreciably vary, even at the same temperature. A safe plan, therefore, before initial weighing of this tube, is to pass through it for a few minutes a current of the gas to be analyzed. This will also serve as a useful qualitative test, in advance, of the amount of HS present.

When the HS is very minute, as it should be in a well-purified street gas, there is another method available, which I have often used, and which may be preferred, as surer. I find that if the granulated blue vitriol be spread out in a gentle sand-bath heat for some days, it loses most of its water, becoming white and chalk-like, without falling to powder, and will now still absorb HS readily, even though the latter be absolutely dry. If F be charged with such dehydrated cupric sulphate, it may be introduced *after* the CaCl tube, G, instead of before, and will then absorb from the gas only HS. If it has lost three equivalents of water, it will no longer impart any moisture to the gas at ordinary temperatures. If, however, the gas is strongly sulphuretted, this plan will not do, as sufficient *sulphuric anhydride* is then set free to act appreciably on the hydrocarbons present, both by absorbing them and by forming SO_2.

After the whole train is put in action, during the actual analysis, should it be practicable to watch the apparatus during this stage, A may be kept immersed in the hot water in B, which will save subsequent expenditure of time in preparation for the final weighing. K must be watched from the first, and if it turns brown very rapidly—indicating much oxygen present—the current must be stopped when the meter has shown about 1 foot flow, and KL taken out to be weighed; resuming, after recording the meter, with a direct connexion from J to M. This because it may not be safe to trust K for more than one foot of a gas largely contaminated with air.

In the absence of an adequate number of *arrows* in this cut, a little examination, I trust, will make clear the course of the gas, from M to the inlet of the meter at its axis in the rear, and out again, through the rubber tube, O, to the final CaCl tube, P, and thence through the vertical glass tube, R, at its exit from which it may be kindled.

The usual rate of flow advisable, if attainable, with this train, is about 1 foot per hour; and the whole amount of gas analyzed should not be ordinarily more than 10 cubic feet. This does not necessarily apply to the NH_3 and HS determinations, however, as in a well-purified street gas the amount of these in 10 feet only might be scarcely appreciable. Therefore, after some 10 feet have passed the meter, the latter having been read and recorded, direct connexion should be established from F to M, the intervening members being thrown out. The flow may then be kept on through A, E, M, the meter, and P, even up to 50 or 100 feet, or until the registered volume is judged sufficient for these two constituents.

In these latter cases it is obvious that the common one-dial photometer-meter, as in fig. 4, will not do the work, and it will be necessary to provide a meter having dials enough to register continuously up to 100 feet, as well as down to decimals of a foot.

In this case, unlike the operation with the crude gas, no general distilling or transferring process is required before the final weighings. It is only essential that A should be free from condensed moisture at the close, by reason of immersion in B, or that it should be subsequently freed therefrom by means of a dry gas current through and from the preparatory train.

V.—Of the Dimensions of the Apparatus, &c.

The sizes and weights of the different pieces of apparatus must not be left unexplained.

Flask C is of one pint capacity. It is convenient to have at least four different sizes or patterns of U-tubes. The largest, represented by H in the preparatory train, is about 13 inches high, 1·1 inch internal calibre, and 2·25 inches between the limbs. The second size is the most useful size, the corresponding dimensions being about 8 × ·9 × 2 inches, and is exemplified in fig. 1 by F, G, H, L, M, and the omitted CaCl tube: and in fig. 4, by G, H, K, and P. The third size, C and D, in fig. 2, and F in fig. 4, may be 6·5 × ·6 × 1·9; and the smallest, represented in duplicate in A, and by J and L in fig. 4, also by J and M in fig. 1, is about 4 × ·4 × ·75.

The relative proportions of different members of a train to each other are worthy of careful consideration in planning an investigation, and much time and labour may often be thus saved. These proportions will differ with the conditions and with the nature of the gas very largely.

For convenience in weighing, wires may be attached, as has been shown in the cuts in one case only—the CaCl tube, G F, in fig. 2. As before stated, these wires, unless of platinum, are objectionable in the atmosphere of a gas-work, and the tubes can just as well be simply laid across the pan of the balance. The balance should be capable of bearing safely a load of at least 300 grams or a little more, and indicating one milligram; that is, of turning perceptibly with the 300,000th of its load.

One of the worst obstacles to accuracy in weighing large glass apparatus delicately being the well-known attraction of glass for moisture, I have adopted, as hinted before a very valuable device: simply to provide thin polished brass or tin cases, closing tightly, but not hermetically, suited in size to different sizes of tubes, within which the latter are shut up while warm and dry.

VI.—Of the Calculation of the Results.

To obtain from the observed volume, as per meter, the true initial volume of the mixed gas and spray operated on, requires some calculation. Taking first the most complex case, that of a crude coal gas from the hydraulic main, we shall have the following:—

Factors.		Densities.*
The observed volume in cubic feet and decimals—which call	$v.$	
The final Fahr. temperature of the gas—which call	$t°$	
The weight of liquid tar in grains—which call	$Lt.$	(Water = 1) = 1·25
The weight of liquid water in grains—which call.	$Lw.$	
The weight of initial watery vapour—which call.	$wv.$†	(Air = 1) = 0·6220
The weight of initial gaseous ammonia (NH_3)—which call	$am.$	„ „ = 0·5896
The weight of initial gaseous sulphuretted hydrogen—which call	$s.$	„ „ = 1·1749
The weight of initial hydrogen carbonic acid—which call	$c.$	„ „ = 1·5202
The weight of initial naphthaline vapour—which call	$n.$	„ „ = 4·5700

Other constants required in our calculation are:

1. The coefficient of dilatation of coal gas for the Fahr. degree. I adopt—

$$\frac{1}{491 \cdot 9}$$

* The densities adopted for NH_3, HS, and CO_2 are the theoretical ones employed by Bunsen in his "Gasometry." Other authorities differ perceptibly about all these. The density of aqueous vapour adopted is very close to Regnault's figure. Bunsen used ·62205.

† It must not be forgotten that an addendum to *wv* is derivable from the final weighing of the bisulphate of potash tube.

2. The number of grains of pure water in a cubic foot, at 60° Fahr., which I make 436,320.

3. The number of grains of dry air in a cubic foot, at 32° Fahr., equal 565 according to Regnault.

As to the first, Ph. Jolly has recently given (*Chemisches Centralblatt* for 1874, p. 241, from Poggendorf's *Annalen*) new determinations, which, for Fahr. degree, are—

For H gas	·002031
For CO gas	·002059
For air gas	·002039*

As coal gas is almost half hydrogen, I have adopted ·002033, which equals

$$\frac{1}{491\cdot9}$$

For calculating the third constant, I have adopted as a basis a figure kindly calculated for me by Professor A. M. Mayer,† directly from the original determination of Regnault, for a litre of dry air under normal tensions, equal 1·29278 gram. Cooke's "Chemical Philosophy" gives this figure equal 1·29319 gram.

From Mayer's figure I get, closely enough, for 1 cubic foot of air, at 32° Fahr., 565 grains.

In the most complex case of all, as in fig. 4, when a wet meter is used, and the gas measured with a certain content of aqueous vapour, afterwards determined by means of the CaCl tube, P, we have, in this weight, still another factor, wv'.

The following crude expression may now be first jotted down, V being the corrected initial *volume* sought, in cubic feet, at 60° Fahr.:—

$$(A.)—V=v+\frac{60-t^\circ}{491\cdot9}v+\frac{Lt}{436320\times\text{dens}\,Lt}+\frac{Lw}{436320}+\frac{wv}{565-\frac{(60-t^\circ)565\,\text{dens}\,wv}{491\cdot9}}-\frac{wv'}{565-\frac{(60-t^\circ)565\,\text{dens}\,wv'}{491\cdot9}}+\frac{1}{\frac{(491\cdot9-60+t^\circ)\,565}{491\cdot9}}\left(\frac{am}{\text{dens}\,am}+\frac{s}{\text{dens}\,s}+\frac{c}{\text{dens}\,c}+\frac{n}{\text{dens}\,n}\right)$$

Which, on interpolating the density figures above, may be reduced to—

$$(B.)—V=1\cdot12198v-\cdot002033t^\circ v+\cdot000002292\left(\frac{Lt}{1\cdot25}+Lw\right)+\frac{wv-wv'}{522\cdot134+\cdot71443t^\circ}+491\cdot9\left(\frac{am}{143876\cdot256+333\cdot124t^\circ}+\frac{s}{286703\cdot2+663\cdot82t^\circ}+\frac{c}{370964\cdot525+858\cdot9t^\circ}+\frac{n}{1115187\cdot4+2582\cdot05t^\circ}\right)$$

In the case in which t° equals 28° Fahr., as when the final temperature is reduced quite down to that of melting ice, we may express it thus:—

$$(C.)—V=1\cdot065065v+\cdot000002292\left(\frac{Lt}{1\cdot25}+Lw\right)+\frac{wv-wv'}{542\cdot14}+\frac{am}{311\cdot45}+\frac{s}{620\cdot65}+\frac{c}{803\cdot06}+\frac{n}{2414\cdot1}$$

In the case of purified illuminating gas, as from street-mains, in which the suspended tar and spray should be, and ordinarily are, inappreciable, the second right-hand member of the equation (C) disappears, as also the last factor representing the condensable naphthaline; and if, in addition, the gas has been measured dry, by means of a dry meter at the tail of the train, so as to eliminate wv', and also at 32° Fahr., we have (omitting also an inappreciable fraction in the first factor) the simplest case of all—

$$(D.)—V=1\cdot0651v+\frac{wv}{542\cdot14}+\frac{am}{311\cdot45}+\frac{s}{620\cdot65}+\frac{c}{803\cdot06}$$

The correction for atmospheric pressure has not been introduced into the above, and is independent thereof. In exact work, the barometer must, of course, be observed at short regular intervals, and V should be further corrected by reduction to the standard pressure of 30 inches or 762 mm. This is simple. Calling the volume, as thus corrected, V, and the mean of the barometric observations P, then—

$$V : V' :: 30 \text{ inches} : P;$$

the volumes being inversely as the pressures; and—

$$V'=\frac{P}{30}V;$$

from whence a rule easily remembered. Multiply the whole of the right-hand sides of the above equations by (·03333 ÷) P. Equation (D.) may then become — corrected further for atmospheric pressure, P:—

$$(E.)—V=\cdot0355\,Pv+\cdot033333\,P\left(\frac{wv}{542\cdot14}+\frac{am}{311\cdot45}+\frac{s}{620\cdot65}+\frac{c}{803\cdot06}\right)$$

To the above discussion it seems proper to append the remark that the data obtained by it, while necessary to the gas chemist, are not indispensably needed by the mere practical expert, who may be more concerned to refer the proportions of the constituents, as found, merely to the volume of purified gas brought to, or near to, normal conditions of tension and moisture. This is a simpler affair. For the bottle of broken ice in the above train, fig. 4, I substitute, in this case, a similar one, filled with clippings of clean sponge saturated with water, to serve the double purpose of bringing the gaseous current both to the temperature of the air and to the maximum content of aqueous vapour correspondent thereto. If this be accurately enough accomplished, the direct reading of the meter, whether the latter be wet or dry, will be the required volume, subject only to the barometric correction above specified. The final CaCl tube is then not needed, though it might still be used as a check upon the process, and will give a general and precise datum from which the gas may be calculated to any standard of temperature and moistness.

* The figure of Regnault for this constant for air is almost the same as this; that of Magnus is a trifle lower. For Fahr. degree:

Regnault ·0020389, or	$\frac{1}{490\cdot46}$
Magnus ·0020377, or	$\frac{1}{490\cdot75}$

† Professor Mayer remarks that he found a slight error in Regnault's own reduction of his observations.

VII.—Examples of Analytical Results of One of these Methods.

To illustrate the character of the work turned out by the analytical train in fig. 1, operated as has been specified, I shall cite some figures obtained some months since in investigating an apparatus now in use at the Harlem Gas-Works, in New York City, which includes a new principle of action, consisting in forcing crude coal gas—before cooling to temperature of air, and in finely divided form—through the liquid products of the retorts, and of the incipient

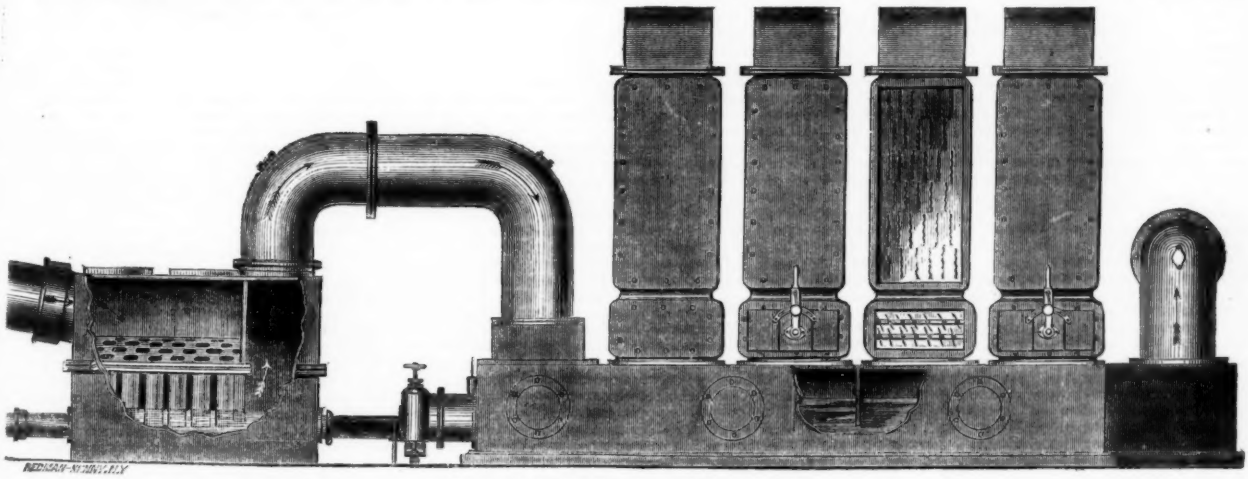
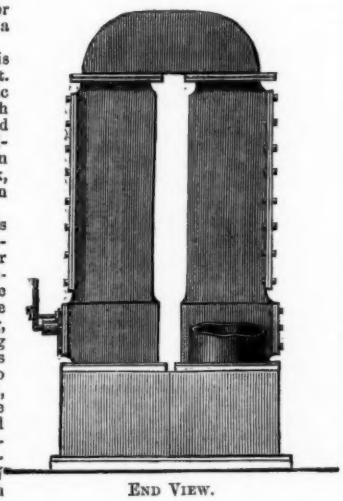


Fig. 5.—The St. John and Rockwell Scrubbers.

condensation of the gas itself, constituting a sort of straining or filtration of the gas through a liquid medium.

On the left of the cut, fig. 5, is shown one of the "boxes" of St. John. The gas from the hydraulic main is pumped down through the vertical tubes, and is obliged to rise through perforated horizontal diaphragms immersed in the liquids that collect in the box, or arrive therein from the main through the lower pipe.

The apparatus on the right is a form of "dry scrubber" appended to the "boxes." Two or more of the latter are used, according to the volume of gas to be dealt with. At Harlem two are erected, an increase to four being, however, contemplated. During my analyses, the gas passing was about 20,000 feet per hour. Two trains, after the plan of fig. 1, were attached, one just before the extreme left-hand arrow, and the other near the extreme right-hand arrow. The results obtained were as follows, about 7 feet of gas having traversed each train:—



End View.

Weights. Grains per 100 Cubic Feet.	Crude Gas from Hydraulic Main.	Condensed Gas from Inlet to Purifiers.	Grs. taken out of each 100 Feet by Scrubbers.	Per Centage taken out of each Impurity.
1. Water	3515·2	2674·5	840·7	23·92
2. Tar	515·0	44·0	471·0	91·46
3. Smoke, soot, dust, &c.*	265·9	55·7	210·2	79·05
4. Naphthaline (condensable).	123·5	25·0	98·5	79·77
5. Ammonia (NH_3).	339·4	237·0	102·4	30·18
6. Sulphuretted hydrogen	1234·9	1105·1	129·8	10·51
7. Carbonic acid	1698·0	1522·1	176·0	10·36
Totals	7691·9	5663·2	2028·7	26·39
Totals without the water.	4176·7	2988·8	1188·0	26·05
Average temperatures—Fahr..	107·5°	94·6°		
Volumes. Cubic Feet per 100.				
Sulphuretted hydrogen.	1·93	1·73	0·20	10·88
Carbonic acid	2·07	1·86	0·22	10·62

Note.—Dividing the above weights by 70 gives, closely enough, the lbs. *per ton* of the impurities.

* Including some of the naphthaline, as explained above.

The coal was a *highly sulphurous* but rich one from West Virginia, known as the "Murphy Run" coal. The temperatures during the operation were as follows:—

Gas in the hydraulic main	125° Fahr.
Gas entering first or left-hand train	108° ,,
Gas entering second or right-hand train	95° ,,
Refrigeration in passing condensers	13° ,,

METROPOLITAN BOARD OF WORKS AND THE WATER COMPANIES.

FIRES IN THE METROPOLIS.

The following is the reply of the Kent Water-Works Company to the circular letter of the board published in the JOURNAL of the 2nd inst:—

"*Kent Water-Works, Mill Lane, Deptford, Feb.* 10, 1875.

"Sir,—Your letter of the 23rd of December last, on behalf of the Fire Brigade Committee of the Metropolitan Board of Works as to the supply of water for the extinguishment of fires, has been considered by the directors of the Kent Water-Works Company with reference to their company's district.

"You therein state that the attention of the Fire Brigade Committee has been called by complaints and inquiries from local boards and others to the delays which occasionally occur in obtaining a supply of water at fires; that the Fire Committee is aware that the only certain way of avoiding these delays, and of being always sure of an immediate supply of water available for extinguishing fires, is to have all the mains constantly charged at high pressure, and that the committee is anxious to ascertain whether in the interval of time which will probably elapse before the attainment of this desired state of things, some means might not be found by which the men of the fire brigade would be able, on arriving at a fire, to obtain immediately for themselves a supply of water, without waiting for a turncock.

"Your letter also informs the directors that with each fire-engine is always carried a complete set of turncock's tools, so that what is wanted under the present intermittent system of supply is a knowledge of what mains in the immediate neighbourhood are charged with water, and you inquire whether some plan could not be adopted of turning water into the various mains at certain fixed hours of the day, and of making the fire brigade acquainted with the hours fixed for each part of the district, so that on reaching a fire the brigade might know at once where to go for the water.

"Before giving the views of the directors of the Kent Water-Works on the subject of the above inquiries, I would premise, that while it is the business of the company to supply the inhabitants with water, they admit it is also their duty to furnish gratuitously water for the extinguishment of fires, and for that end to afford every facility, but it rests with your board to provide the necessary appliances for the effective use of the water.

"The directors of the Kent Water-Works are surprised at the inference, which the language of your letter conveys, that the company's mains are not always charged at high pressure, whereas such mains, as distinguished from service-pipes, are in fact now, and always have been, so charged.

"It will be in the recollection of your board, that in consequence of some accusations of late attendances at fires by the company's turncocks, the then secretary of the Kent Water-Works Company, on Aug. 11, 1869, addressed a letter on the subject to your board, in which he informed them that the company maintained by their machinery a constant pressure in all their mains (about 80 miles), aided by reservoirs, at various altitudes, varying from 163 to 314 feet above Ordnance datum; that these mains thus charged were available for hydrants from which, if fixed, water at full pressure could be obtained at all times day and night; that the street services were connected with the mains by cocks, and upon opening these cocks these services could at all times be charged with water at full pressure; that fire-plugs, at frequent intervals, were placed on these services, and were used for cleansing the pipes supplying the inhabitants with water during severe frosts, and for the supply of fire-engines; that at that time, with the exception of Woolwich and partially of Greenwich, no steps had been taken by any authority, including your board, to avail themselves of the use of these mains, or to co-operate with the company in any way for the improvement of the means of extinguishing fires, although they possessed full parliamentary powers for the purpose; and the company suggested that as regards the services where the supply is intermittent, some arrangement should be made that would indicate the exact spot in any street where the use of a key would enable any officer of the fire brigade to procure, instantaneously, a full supply of water. The letter concluded with an expression of the willingness of the directors of this company to assist at all times, to the utmost of their powers, to effect any improvement in the supply of water for the extinguishing of fires; and in the following week, by their desire, Mr. Morris (their late engineer) wrote to the chief officer of the fire brigade, offering to afford him every assistance and information with respect to fire-cocks, hydrants, and plugs in the company's district, and to produce plans of the company's pipeage.

"Your board did not answer the letter of Aug. 11, 1869, until April 8, 1870, and then only upon being urged by the then secretary of the company to do so. Their answer with reference to the suggestion that hydrants should be put upon the mains was, that the subject was still under the consideration of the Fire Committee; and with regard to the second suggestion—viz., that where the supply was intermittent some arrangement should be made that would indicate the exact spot in any street where the use of a key would enable any officer of the fire brigade to procure, instantaneously, a supply of water, your committee replied that they were of opinion that it would not be practicable under the present system of intermittent supply.

"The directors of the Kent Water-Works are not aware that to your letter of the 23rd of December last any other answer can be given than that which is expressed in the suggestions contained in the letter of the then secretary of the company, dated the 11th of August, 1869.

"From that day to the present, now upwards of four years, the directors of this company have not received any further communication from your board upon the subject, except as regards the districts of Rotherhithe and Plumstead, which, by the voluntary action of the company, have been placed under constant supply; your board having, upon the requisition of the company, in compliance with the recent Act, caused 30 hydrants to be placed upon the mains in the former; but the greater part of the company's mains are still without hydrants, and, with the exception of the district first named, are still in the same condition in that respect as they were at the time of the correspondence before referred to.

"The directors of the Kent Water-Works Company consider that the suggestions contained in your letter for turning the water into the services at fixed periods, and giving information thereof to the fire brigade, are not capable of being practically carried out.

"They, however, desire me to inform your board that they are fully alive to the great importance of the subject of the supply of water for the extinguishment of fires, as indeed they have evinced by taking the initiative in making suggestions years since, as shown by the correspondence; and they have, from time to time, taken every step within their province to provide a prompt and abundant delivery of water at fires.

"In order to ensure the speedy attendance of the turncocks at fires, the company some time since required their turncocks to reside close to the fire brigade stations, since which complaints of delay have ceased.

"In conclusion I am desired again to suggest, as the only practicable solution of the question, that your board cause hydrants to be placed on the whole of the company's mains where they are now wanting; and that, as regards the services, some arrangements be come to for indicating the spot in every street where the use of the key would enable the officer of the fire brigade to procure a supply of water. For this object the directors of the Kent Water-Works are anxious to afford every facility, and they direct me also to suggest that some officer of the brigade be placed in personal communication with their engineer in order to concert measures for the attainment of it.—I am, sir, your obedient servant,

"ALEXANDER DICKSON, Secretary.

"J. E. Wakefield, Esq., Clerk to the Metropolitan Board of Works,
Spring Gardens, S.W."

MANCHESTER (CORPORATION) GAS SUPPLY.

PROPOSED ERECTION OF NEW WORKS.

An Adjourned Meeting of the City Council was held on Wednesday last, to resume consideration of the report of the Gas Committee presented on the 3rd inst., recommending an early extension of the means of production and storeage—the MAYOR (Alderman King) presided.

Mr. W. SMITH, who had moved the adjournment, now resumed the discussion, and moved that the further consideration of the report be postponed, and that the committee be instructed to make inquiry respecting a suitable piece of land near Barton Moss station. He stated that he was informed that if an application were made to Sir Humphrey de Trafford for land for the purpose of making gas-works near Barton Moss station he would not only receive the application favourably, but would endeavour to meet the corporation in the matter in the most liberal terms.

Mr. ASHTON seconded the amendment. He pointed out that the proposed site near Bradford was unsuitable, because it was undermined by old pit workings, and was gradually subsiding, and also because it was the highest land in the town.

Alderman BOOTH admitted the necessity that steps should be taken to extend the gas-works, but recommended the Gas Committee, before proceeding to erect works on the land near Philips Park, to take the opinion of some eminent engineer as to the advisability or otherwise of establishing one work for the manufacture of gas for the entire city, the present stations to be used for storeage purposes.

Mr. ROBERTS supported the suggestion made by Alderman Booth.

Mr. J. A. BIRCH said it appeared that the question was whether the site proposed by the Gas Committee was not as desirable as any that could present itself. There was no doubt that Sir Humphrey de Trafford would possibly find a site for the gas-works, because he probably understood the gas-works were not such a nuisance as they were reported to be. If gas-works were such a nuisance, he could imagine that Sir Humphrey would not have been so ready, because when asked to give a site for the utilization of sewage he declined to do so. He (Mr. Birch) objected to the gas-works being taken to Barton Moss, because, apart from the fact of the great condensation that would take place in conveying the gas in pipes so great a distance, the pipes would require to be laid for a long distance through a district which the corporation did not supply. He argued that the site near Bradford was most suitable, on the ground that the nuisances in that district, arising from the overloading of the atmosphere with chemicals and offensive smells, could not be increased by anything so comparatively innocuous as the smell from a gas-work, which, he contended, though unpleasant, was not prejudicial to health.

Mr. G. BOOTH objected to the proposals of the Gas Committee. He did not admit the validity of the plea of urgency on which the proposal was supported, and argued that the difficulty could be met by a small extension of the existing works. He maintained that gas was not a necessity of life, like air or water. Even if short of gas for a day or two in the depth of winter, people could manage to submit to the temporary inconvenience.

Mr. CROSTON supported the recommendation of the committee.

Mr. STEWART narrated a conversation which he had had with Sir Humphrey de Trafford and his principal agent, Mr. Ellis, as to the suggested site for gas-works at Barton Moss. The reply to his question whether Sir Humphrey would entertain an application from the corporation for the erection of gas-works on his estate, was by Mr. Ellis: "He would not only entertain it, but would, I can assure you, entertain it most favourably." Sir Humphrey's land extended from the proposed site to Pomona, and the corporation could lay their pipes all the way to the city boundary without consulting any one excepting Sir Humphrey, and without there being any necessity for an Act of Parliament, or any delay excepting such as would occur in making a simple bargain as between two gentlemen. The site which he indicated was not more than 2¼ miles from Manchester, on a tract of land lying between the railway on the one side and the river navigation on the other. With regard to the stability of the site, he knew that the peat bog was on an average only 4 feet deep, and that nearest the railway, where it was deepest, it was only 11 feet, and below that there was a solid clay bottom.

Mr. R. K. PAYNE pointed out that Gorton and other districts, which were at present supplied with gas by the corporation, were contemplating taking measures for securing this supply.

Mr. C. WALKER suggested that such a circumstance might offer a means of getting out of the difficulty, and that the further discussion of the question might be adjourned.

Mr. ANDERSON said that five years ago he opposed the Gas Committee upon this question, but now their proposal had become so urgent, that he gave it his hearty support. In reply to Mr. Walker, he said that even if the people of Gorton had in serious contemplation the proposal to supply their own gas, their scheme could not be carried out for a long time to come, and in the meantime Manchester, if further delay occurred in obtaining new gas-works, must suffer great inconvenience from a short supply. The proposed abandonment of the site near Bradford would not be in the interest of the inhabitants of that neighbourhood, inasmuch as the site available there was scarcely likely to be taken up by any one for purposes less offensive than gas-works.

The MAYOR, as chairman of the Gas Committee, interposed at this stage of the discussion, and intimated that, although in his opinion it might have been desirable that the communications which had been made to the council with regard to the proposed site at Barton Moss might first have been made to the Gas Committee, the committee were willing to take it into consideration, and report to the meeting of the council in April.

Mr. Walton Smith's proposal was then agreed to upon this understanding.

An open-air meeting, very numerously attended, was held near the Bradford Cemetery, on Saturday afternoon, Feb. 13, for the purpose of protesting against the proposal, which is to be considered at the next meeting of the council, to erect new gas-works at Bradford-cum-Beswick. The Rev. Mr. West, rector of St. Philip's, presided, and in opening the proceedings, said he felt quite sure that they needed no addition in that district to the nuisances from which they now suffered, and that the establishment of gas-works would be very prejudicial to the health of the inhabitants. In prospect of the park, which had been provided mainly by the liberality of working men for their recreation, he was certain they would be of opinion that it would be almost like undoing that work by bringing gas-works into the district. After the delivery of several addresses, it was resolved that the chairman be requested to present a memorial to the council, embodying the views of the meeting, and that deputations be appointed to wait on the members of the council to request them to support the prayer of the memorialists.

ASH NEXT SANDWICH GAS COMPANY.—The annual meeting of shareholders was held on the 10th inst. In consequence of the considerable expense incurred in altering and improving the works, the directors were unable to recommend the shareholders to declare a dividend. The recent improvements have effected a very considerable saving in the consumption of coal, and will enable the directors to conduct the business on a more economical scale for the future. They have been made under the advice and superintendence of W. A. Valon, Esq., C.E., of Ramsgate, to whom a vote of thanks was unanimously passed for his valuable services. Mr. W. Dixon and Mr. E. Young, retiring directors, were re-elected. Mr. Bunce was re-elected auditor.

IPSWICH GAS COMPANY.

The Annual Meeting of Shareholders was held on the 15th inst.—Mr. W. Bunn (chairman of the board of directors) presiding.

The advertisement convening the meeting having been read, and the chairman having affixed the seal to the register of shareholders,

The Manager (Mr. E. Goddard) read the following report from the directors:—

The directors, in presenting their report, have pleasure in stating that the business of the company during the past year has been satisfactory.

During the year the mains in Friars Road and from the Cornhill to Orford Street have been renewed with pipes of larger dimensions, which has greatly improved the supply of gas in the outlying western districts of the town, and in order to remedy the defective supply in the St. Helen's and Woodbridge Road districts, where the demand for gas has been greatly augmented in consequence of the large manufactories which have been established there, the directors have determined upon substituting larger mains for those now in use from Orwell Place to St. Margaret's Green.

The carbonizing power of the works was taxed to its maximum production at Christmas time, every retort being in full operation; it is therefore absolutely necessary, having regard to the increasing requirements of the town, to make considerable extensions to the working plant before next winter. With this view the directors are making arrangement for the erection of an additional retort-house and coal stores on the plot of land facing the dock, a steam lift for unloading coal from vessels, also enlarged condensing and purifying apparatus. The estimated outlay for carrying out these additional works is £10,000, to raise which sum they recommend, under the existing powers of the company, the creation of 600 new shares of £10 each and the remainder by mortgage bonds.

The accounts have been carefully examined and certified by the auditors. The profit and loss account shows a balance in favour of the company of £4498 15s. 3d. available for the payment of dividends. The directors therefore recommend that a dividend at the rate of 10 per cent. upon the original shares, and 7½d per cent. upon the new shares paid up, be paid to the shareholders, and that the balance of £229 10s. 3d. be carried forward.

The directors have pleasure in being able to announce a reduction in the price of gas from 4s. 3d. to 4s. per 1000 cubic feet, to take effect from the 1st of July next.

John Chevallier Cobbold, Esq., Robert Garrod, Esq., and Col. Henry Phillipps go off the direction by rotation, all of whom are eligible for re-election.

Mr. William Bantoft, one of the auditors of the company, goes out of office by rotation, and is eligible for re-election.

The statement of accounts was also read. The profit and loss account commenced, on the credit side, with a balance from last year of £318 5s. 9d.; private light rental, including rental of gas-meters and fittings, £17,340 2s. 11d.; public light rental, £2026 9s. 11d.; sale of coke, ammonia, and tar, £4896 17s. 3d.; gas-fittings, £88 5s. 8d.; rental of land, £108; total, £24,778 1s. 6d. On the other side, the principal items were coal, £12,423 16s. 4d.; salaries and wages, £2561 9s. 7d.; rates and taxes, £761 8s. 3d.; interest on bonds, £625 1s. 1d.; total, £20,279 6s. 3d.; leaving a balance, as stated in the report, of £4498 15s. 3d.

The Chairman, in moving the adoption of the report, said he did not think any observation was needed on his part, except that he might venture to congratulate their shareholders upon the satisfactory progress the company had made during the year, and that not only could they pay the usual dividend, but that they were in a position to take off part of the increase in the price of gas which they were obliged to put on two years or so ago, in consequence of the great rise in the price of coal.

Mr. F. Alexander asked what were the receipts of 1874 and of 1873.

Mr. Goddard said in 1873 the total amount on the credit side of the profit and loss account was £24,296 0s. 9d., and in 1874 it was £24,778 1s. 6d. The rental for gas in 1873 was £16,441 9s. 11d., and in 1874 it was £17,340 2s. 11d. There was a considerable reduction in the price of coke; the receipts for coke in 1873 being £4935, and in 1874 only £4168.

Mr. F. Alexander asked what was the price of gas before it was raised.

The Chairman said it used to be 3s. 9d., but was raised to 4s. 3d. in consequence of the rise in the cost of coal. They were now in a position to take off half that increase.

Mr. W. B. Jeffries seconded the motion for the adoption of the report, and it was unanimously agreed to.

The formal resolution, declaring a dividend of £1 per share on the old and 15s. on the new shares, was agreed to. Mr. J. C. Cobbold, Mr. R. Garrod, and Colonel Phillipps, the retiring directors, were unanimously re-elected, and Mr. W. Bantoft was reappointed auditor.

The meeting was then made special to authorize the increase of the capital by the creation of £600 new shares of £10 each, and the borrowing of £4000 on mortgage.

The Chairman, in moving the resolution for effecting this object, said the works must be extended, as the increase in the consumption of gas went on so rapidly, and the directors had determined upon expending £10,000, which they thought would be sufficient.

Mr. W. Alexander seconded the motion, and it was agreed to.

The Chairman moved that the shares so created should be offered by auction to the public on such terms and conditions as the directors might think expedient.

Mr. Jeffries asked whether it might not be desirable to give the present shareholders the opportunity of taking the shares.

The Chairman said the directors thought it desirable, as on former occasions, to offer the shares to the public. The proprietory was thus enlarged, and the public got the advantage of the premium which might be obtained, no interest being paid on it.

Mr. J. C. Cobbold seconded the motion, and it was agreed to.

Mr. Goddard said before the meeting separated he wished to make one or two remarks upon some observations by Mr. Packard at the last meeting of the Town Council, in which Mr. Packard said that which was the truth, but not the whole truth, and which appeared somewhat invidious to the company, and he (Mr. Goddard) thought a little disingenuous. Mr. Packard said that a town in the West of England—Plymouth—was supplied with gas at 3s. per 1000, whilst the Ipswich Gaslight Company, though Ipswich was much nearer the coal-pits, were charging 4s. 3d. Mr. Packard had called his (Mr. Goddard's) attention to this fact some few days before, in the presence of their esteemed member, Mr. J. P. Cobbold, and he then explained to Mr. Packard how it was that the Plymouth Company was able to supply gas at a cheaper rate than many other towns. It so happened that a railway company required the property held by the Plymouth Gas Company, and paid them a very large premium for it, and rebuilt their works. This gave the gas company a large amount of capital which was not dividend bearing, and they could, therefore, manufacture gas at a much cheaper rate than other people. Mr. Packard also referred to the increase in the capital of this company as being calculated to keep up the price of gas by maintaining the dividend of 10 per cent. on the increased capital. The directors, when they required to raise fresh capital, had pursued the course of throwing the shares open to the public at their market value, whatever it might be; hence, the monopoly which was complained of was open to any one who wished to purchase shares. He thought it right to make these observations, because an impression was set afloat that the company were availing themselves of this fresh capital in order to maintain a higher rate of dividend, but such was not the case, for the shares were sold by auction, and the premium went to the capital of the concern, and, bearing no interest, enabled the company to make the reduction in the price of gas earlier than they otherwise could have done.

The Chairman said the observations Mr. Goddard had made ought, perhaps, to have come from him (the chairman), but Mr. Westhorp having answered Mr. Packard at the meeting of the council, he had not thought it necessary to refer to the matter. He did not think it exactly fair, having had the explanation from Mr. Goddard a few days before, that Mr. Packard should have gone to the council with the statement he did. The company did not pay anything like 10 per cent., for they now took power to raise £4000 on mortgage, which they would get at 4½ per cent., and the interest on the nominal value of the new shares could not exceed 7½ per cent., whilst the premiums that might be obtained went to capital, but received no interest.

Mr. J. C. Cobbold proposed a vote of thanks to the chairman, observing that, as one of the directors, he could speak to Mr. Bunn's constant and assiduous attention to his duties, and he was sure the general body of the shareholders would confirm him when he said the chairman admirably conducted the business at the general meetings.

Mr. F. Alexander seconded the motion, which was unanimously agreed to.

The Chairman, in responding, said he had for a very long time been one of the proprietors of the company; he had taken great interest in it, and should continue to do so as long as his health permitted.

On the motion of Mr. Acfield, seconded by Mr. J. C. Cobbold, a hearty vote of thanks was passed to Mr. Goddard, and the meeting ended.

BURY ST. EDMUND'S GAS COMPANY.

The Half-Yearly Meeting was held on the 12th inst.—Mr. H. Turner (the chairman of the company) presiding.

The Secretary (Mr. Salmon) read the report of the directors, which recommended the payment of a dividend of 10s. per share (10 per cent.) on the old capital, and 4s. 1d. per share (7½ per cent.) on the new capital (both free of income-tax).

The following statements of account were presented:—

Permanent Capital.

Dr.				*Cr.*			
Received in calls on old capital	£12,000	0	0	Permanent capital to this time, as per last half-yearly account	£24,161	2	11
Received in calls on new capital	9,900	0	0	Balance in hand	238	17	1
Received loan from Paving Commissioners	2,500	0	0				
	£24,400	0	0		£24,400	0	0

Revenue Account, from July 1 to Dec. 31, 1874.

Balance from last account	£1,335	9	5	Wages and salaries	£803	19	10
Coke and tar	703	19	2	Printing, advertising, and stationery	5	9	7
Fittings and labour	83	4	3	Rates and taxes	84	1	5
Gas and meters	2,038	1	6	Petty disbursements	32	14	7
Transfer fees	9	5	0	Coals, cartage, freight, and carriage	1,297	3	7
	£4,169	19	4	Fittings	91	4	11
Accounts uncollected on July 1, 1874, and since received	1,269	15	5	Ironmongery, paint, glass, and oil	22	19	2
	£2,909	3	11	Fire-bricks, clay, and retorts	21	1	0
Arrears due on Sept. 30, 1874	87	8	7	Lime	52	16	1
Accounts due to Dec. 31, 1874, and then uncollected, as under:—				Repairs	621	5	4
Coke and tar	403	14	3	Dividends due on Jan. 1, 1875, as under:—			
Gas and meters	2,557	11	7	On £12,000 old capital, at 10s. per share	600	0	0
Fittings and labour	120	3	3	On £9900 new capital, at 4s. 1d. per share	367	10	0
				Depreciation of stock	385	19	1
				Balance carried to next account	1,682	17	0
	£6,069	1	7		£6,069	1	7

The Chairman, in moving the adoption of the report, called the attention of the shareholders to the account for the corresponding period of last year, and said they would find, although not a very large increase, still a steady improvement in the sale of their products. It was with great unwillingness that the directors, in 1873, raised the price of gas 10d. per 1000, and at that time the promise was made that the increase should be taken off again at the earliest possible moment. In July last the directors, thinking the state of the accounts justified the step, reduced the price 5d. per 1000, and now, although they were not quite satisfied the right moment had come, they were anxious to give the public every fair advantage, and had resolved to make a futher reduction of 5d. from the 1st of January—bringing the price down to the lowest point gas had ever reached in Bury. They congratulated themselves the more on being able to do that, seeing that not far off, in a town where more than twice the quantity of gas was made, the consumers were in a ferment because of a proposed application by the company to Parliament to enable them to raise their maximum charge to 5s. 5d. They were, in fact, trying to put on the very 5d. this company had now voluntarily relinquished, and, in all probability, unless that company acted wisely, and were content with 5s., the town and the company would fight the battle out in the House of Commons, at the expense of £2000 or £3000 to each. The chairman then alluded to the large item that appeared in the accounts for repairs, and said that everybody in the town was aware of the great work that had been in progress in relaying the mains in the streets, but two-thirds of this task was completed, and it was intended to do the rest at an early period of the spring, so as to inconvenience customers as little as possible; it was hoped that it would be completed before he (the chairman) had again the pleasure of meeting the shareholders.

The motion was seconded by Mr. G. Thompson, and carried.

The retiring directors and auditors were severally re-elected.

Mr. T. Ridley proposed, in very flattering terms, a vote of thanks to the chairman for his past services, and this was cordially seconded by Mr. Geo. Thompson, and carried *nem. con.*

Mr. Turner, in responding, remarked that it was unusual for this vote to be proposed and seconded by directors, but as they were more fully acquainted than the shareholders with the nature of his duties and the way in which they were performed, he looked upon it as a great compliment.

A vote of thanks was given to the auditors, with an expression of regret that one of them (Mr. Clay) was too unwell to be present, which was acknowledged by Mr. Hooper.

A vote of thanks was also given to the manager, Mr. T. H. Methven, who, in responding, said he looked upon the coal famine as not being altogether a bad thing for gas companies. It had made them look into matters more closely, in order to work more economically, and by-and-by he believed they would be able to make gas as cheap with coals at a high price as they used to do when they were low, simply by adopting economical systems of manufacture.

A vote of thanks to the secretary followed, and in responding Mr. Salmon remarked that that day completed his quarter of a century's service with the company, and it was gratifying to him to think that that long period had passed almost without a disagreeable word. He was glad to know that they were better off than at any one period during those 25 years. This success he attributed entirely to the excellent management, and to the fact that it was the exception not to find the whole of the directors at their posts at the weekly meetings.

This concluded the business of the meeting.

Reductions in the Price of Gas.—The Morecambe Gas Company have reduced their price from 5s. 10d. to 5s. 5d., as from the beginning of the year; a reduction to 5s. has also been made at Bury St. Edmund's. At Sandwich the price is reduced from 6s. 8d. to 5s. 8d., and at Crieff from 9s. 2d. to 8s. 4d. The Ipswich Company announce that from the 1st of July next their price will be reduced from 4s. 3d. to 4s. At Rye the price will be reduced from 6s. to 5s. on the 6th of April next.

LIVERPOOL UNITED GASLIGHT COMPANY.

The Half-Yearly Meeting of the Shareholders in this Company was held on the 16th inst.—Mr. JAMES LISTER in the chair.

The SECRETARY (Mr. Garnett) read the report, which stated that the directors recommendedthe declaration of a dividend for the half year of £5 on every £100 of the ordinary consolidated stock, and at the rate of £3 10s. on every £100 of the "Consolidated B" (7 per cent.) stock, and on the capital paid up in respect of the new £7 10s. shares. A vacancy having occurred in the directorate by the death of Mr. C. W. Reade, one of the oldest directors, it had been filled up by the appointment of Mr. F. A. Clint.

The CHAIRMAN, in moving the adoption of the report, congratulated the shareholders that the directors had been able to supply the town with gas at all, seeing the trouble and difficulty they had in getting the needful supply of coal, and that they had the pleasure of giving the usual dividend.

Mr. J. A. TINNE seconded the adoption of the report.

The Rev. T. GARDNER asked how it was that, a general meeting being so imminent, the appointment of a successor to the late Mr. Reade had not been left over until that meeting was held. He thought it would have been more satisfactory if the shareholders generally had had a voice in the election of the new director.

The CHAIRMAN said the directors had adopted the usual course, and had chosen the best man they could.

Mr. TYRER said he thought the general opinion of outsiders was that they could not have selected a better man than Mr. Clint, especially as, considering that there were amateur detectives wandering about town at night testing lamp-burners and bringing down obloquy upon the company, it was desirable that they should have some one in the Town Council to say a word on behalf of the integrity of the company.

The report was then adopted, and the dividend recommended having been declared, the meeting separated.

LEICESTER WATER-WORKS COMPANY.

The Half-Yearly Meeting of Shareholders was held on the 15th inst.—Mr. ELLIS in the chair.

The SECRETARY (Mr. J. H. Williams) read the report of the directors, the leading paragraphs of which were as follows:—

The directors have to report that during the half year the gross receipts amounted to		£10,139	8 5
From which deduct—			
Working expenses	£2,002 2 2		
Rates	530 6 0		
Interest	1,228 11 5		
	£3,760 19 7		
Leaving net profit		£6,378	8 10
Apportioned as required by the company's Act:—			
To the shareholders		5,589	4 5
To the Local Board of Health		789	4 7
		£6,378	8 10
From the shareholders proportion		5,589	4 5
Deduct income-tax		56	9 0
		£5,532	15 5
Add balance from last half year and interest		376	9 2
Leaving at the disposal of the shareholders		£5,909	4 7

From this amount your directors recommend a dividend at the rate of 5½ per cent. per annum for the half year (free from income-tax), leaving a balance of £409 4s. 7d. to be carried forward to the next account. During the half year the sum of £1096 8s. 2d. has been expended on capital account in extending mains, and in the completion of the stand-pipe at the Gilroes reservoir. In consequence of the small rainfall of the year, an unusually large quantity of water had to be taken from Bradgate, and the expenses of pumping are correspondingly increased during the half year to which the report refers. The working expenses are also considerably larger in the item of rates and taxes, the amount paid under this head during the year having reached the sum of £962 10s. 6d. The directors are able to report that the works of the company are well maintained and in good condition. A bill has been deposited for the present session of Parliament, in which powers are sought to raise additional capital to the extent of £100,000 in shares, and £25,000 by borrowing. A special meeting is summoned for this day to consider the provisions of the bill.

The CHAIRMAN, in moving the adoption of the report, said the working expenses of the half year were rather heavier than usual, principally owing to the cost of pumping, and to the extra rates paid by the company. The pumping was increased, as stated in the report, from the necessity which they had been under of obtaining a large portion of the supply of water for the town from the Bradgate works, caused by the small rainfall for the year, and the consequent exhaustion of the Thornton reservoir. The rainfall in 1874 was about 20¼ inches, as against an average of rather more than 26 inches; and, as a consequence, they had to provide upwards of 350 millions of gallons of water from their Bradgate reservoir. The capital account had been increased by the outlay of rather more than £1000, which was moderate. The total outlay of capital at present amounted to £259,021, and they were authorized to raise under their Acts of Parliament £256,600; therefore it followed that they had spent £2400 more than they were authorized to raise, and that proved the absolute necessity of their obtaining further powers in the present session of Parliament to raise capital, or otherwise they would be compelled to suspend the extension of the mains of the company. Notwithstanding the increase in the expenses of the company, the balance of net revenue was rather more than the previous half year, being £6378 against £6273; and the result was that, after paying the corporation under their agreement with them £789, they were able to recommend a dividend on the whole of the share capital at the rate of 5½ per cent., and to carry over a balance of £409, which was rather more than the balance brought forward from the beginning of the half year. It might be interesting to the shareholders if he stated the position of the company with regard to the capital expenditure, dividend account, and surplus profits account to the corporation during the past eight years. In 1867, the year in which they began to form their new reservoir at Bradgate, and, consequently, to increase the capital of the company largely, the capital expended was £129,070, they paid a dividend of 7 per cent., and paid the corporation for surplus profits £2778. In 1868 they had increased the capital to £143,997, the dividend was reduced to 6 per cent., and the amount paid to the corporation was £2356. In 1869 the increase of capital was above £45,000, raising it to £188,204, the dividend was 6 per cent, and the amount paid to the corporation was £2003. In 1870 the amount of capital had increased to £234,900, and the dividend was reduced to 5½ per cent., the surplus paid to the corporation being £885. In 1871 the capital was increased to £246,033, the dividend was reduced to 5 per cent., and the profit paid to the corporation to £368. That was the year in which the dividend and surplus profits were the lowest, and after that they began to recover a little. In 1872 the capital was increased by £5500 to £252,564, the dividend was 5¼ per cent., and the profit paid to the corporation £402. In 1873 the capital was £257,032, the dividend was 5½ per cent., and the amount paid to the corporation £1318. Last year the capital stood at £259,021, the dividend was 5½ per cent., and the amount paid to the corporation £1526. So that in 1867 the capital was £129,000, and in 1874 it was more than doubled, increased to £259,000; the dividend had been reduced from 7 per cent. to 5½ per cent., and the amount paid to the corporation from £2678 to £1526. Of course the large outlay of capital which had to be brought in to receive dividend had a very serious effect on the dividend of the company, and it would require many years of business gradually to increase the dividend again to the old rate, and to pay a similar sum to the corporation. As the town increased there could be no doubt that the company would gradually recover their position, and in the end, considering the excellent nature of their works, they would exceed not only the dividend they paid in 1867, but also pay a considerably larger amount to the corporation. With regard to the outlay of capital, he might say that there would be a considerable expense coming upon the company shortly, arising from the necessity that they would be under of increasing the distributing mains in the town.

Mr. W. H. ELLIS seconded the motion, which was carried unanimously.

A dividend at the rate of 5½ per cent. per annum, free of income-tax, was declared, and ordered to be paid on March 1. The retiring directors and auditors were re-elected, and the usual votes of thanks were passed.

The meeting was then made special, to consider the bill now before Parliament, which, after some discussion, was approved.

A Special Meeting of the Leicester Town Council was held on the 18th inst., at which a report was presented from the Parliamentary Committee, recommending that the corporation should petition against the bill of the water-works company. The report was adopted, and the petition agreed to. It set out the relations existing between the corporation and the company under former Acts, and stated that the present bill of the company proposed to raise £100,000, with a 10 per cent. dividend, from sharing in which the corporation were to be debarred.

ON NOXIOUS AND OFFENSIVE TRADES AND MANUFACTURES, WITH ESPECIAL REFERENCE TO THE BEST PRACTICABLE MEANS OF ABATING THE SEVERAL NUISANCES THEREFROM.

By H. LETHEBY, M.B., M.A., &c.; Professor of Chemistry in the College of the London Hospital; late Medical Officer of Health and Public Analyst for the City of London; and President of the Society of Medical Officers of Health.

[A Paper read before the Society of Medical Officers of Health, Saturday, Jan. 16, 1875.]

(*Continued from page* 158.)

Dead oil or creosote is largely employed for preserving timber; but, unless there is great carelessness in the management of the operations, they are not offensive. The process is conducted in the following manner:—The timber to be creosoted is placed in iron cylinders of great strength and capacity, and when the end opening is closed and well secured with screws, the interior of the cylinder is exhausted by means of an air-pump, until there is a vacuum of only about 5 inches of mercury. This is maintained for nearly half an hour, during which time the contents of the cylinder are heated by steam-pipes. In this manner the air and moisture of the wood are drawn out of it, and dead oil is then allowed to run into the cylinder until it is full. The heat is continued, and pressure is put upon the contents of the cylinder until it reaches to from 100 to 150 lbs. upon the square inch. This is maintained for many hours—the time varying from 4 to 12 hours, according to the nature of the work. In most cases the amount of creosote absorbed by the wood ranges from 40 to 50 gallons to the load of 50 cubic feet. The oil is then run out, and, when sufficiently drained, the timber is ready for delivery. Hardly any precaution is necessary beyond that of preventing the unnecessary escape of creosote oil and vapour.

Dead oil is also used as fuel, and there are two ways in which it has been successfully employed. In one case, the oil is converted into vapour in a specially contrived boiler, and the vapour is burned as fuel. In the other, the creosote is delivered from a jet immediately over a steam jet, and, as the creosote trickles down from the upper jet, it meets the blast of steam, which blows it as a fine spray upon a bed of glowing cinders or ashes. In this manner it produces a sheet of flame of great heating power. A ton of creosote, which is about 210 gallons, is equal to about two tons of ordinary coals; but the management of the jet or stream of creosote is rather a delicate operation, as an excess of the oil produces an immense volume of smoke, with the acrid irritating odour of the unburnt oil.

Before leaving the subject of these hydrocarbons, I may state that the melting of pitch and asphalte for the production of materials suited for the making of asphalte pavements, &c., is in the generality of cases a very offensive operation. All sorts of pitchy matters, as the residuum of paraffin oil (technically called "shell-grease"), Trinidad bitumen, various natural asphaltes, and coal tar pitch are melted in small iron boilers set over naked fires. The boilers are but loosely covered, and during the melting and mixing, to produce the material called "bitumen," large volumes of irritating and offensive vapours escape into the air. The bitumen thus produced is, in some cases, again heated with powdered asphalte in specially constructed boilers having a mixer moved by machinery; and in this case offensive vapours are freely evolved. The charge, when thoroughly incorporated and melted, is called "mastick," and is drawn off into pails, and cast in moulds for use where the pavement is to be laid. All these operations should be conducted in closed boilers, which should be ventilated by a fan through a scrubber prior to its entrance into the chimney-shaft.

The clarification of oil for burning and other purposes is generally effected by means of sulphuric acid, which is well stirred into it. After the black flocculi, formed by the action of sulphuric acid upon impurities, have subsided, the oil is further clarified by means of water and steam, the latter being blown into it until it reaches a rather high temperature; and during this part of the operation the oil is kept in gentle agitation by means of stirrers, so as to favour the separation of the oil from water and other impurities. In the case of rape or colza oil, the vapours which are given off are disagreeable and acrid, like mustard, while those of linseed and other oils are also offensive, though in a less degree. Cotton oil is refined by means of a solution of caustic soda, and this also, when subsequently heated by steam, is offensive. The remedy in each case is the carrying on of the operations in closed vessels, ventilated to the furnace fire.

The distillation of oils and fats for the production of stearic, margaric, palmic, oleic, and other fatty acids, is effected by means of sulphuric acid and superheated steam. The melted fat is run into vats or boilers, where it is heated to a temperature of about 240° Fahr. At this temperature it receives a dose or charge of strong sulphuric acid, delivered into it as a fine spray, or through perforated copper trays. All this time it is kept in continual agitation by means of stirrers, and this is prolonged for about an hour, during which time a little sulphurous acid and acroleine escape. When the fat acquires a dirty greenish tint, the "saponification," as it is called, is complete. Boiling water is then run into the mixture, and steam blown through it for about four hours; after this it settles for a couple of hours, and the acid watery portion is run off. It is washed a second time with hot water and steam, and when clear, it is delivered into the stills for treatment with high-pressure superheated steam, the pressure being about 50 lbs. on the inch, and the temperature about 500° Fahr. At this temperature and pressure the fatty acids are distilled over, and are collected in a series of condensers, ending in a worm set in cold water. The first condenser delivers the greater part of the fatty acids with but little water, the second more water and less acid, and so on to the end, where water is the chief product. The water contains glycerine, and the residuum in the stills is a sort of pitch, which is used by the asphalte makers.

In these operations sulphurous acid and acroleine are evolved, so as to be offensive to the neighbourhood, unless they are conveyed from air-tight apparatus into the furnace fire.

Oil boiling for making varnishes, linoleum, leather cloth, printers ink, and black japan, is a very disagreeable operation, and requires to be conducted in boilers, from which the fumes pass into the furnace fire to be destroyed.

Varnish-making and resin-distilling are also offensive operations, and necessitate the destruction of the acrid organic vapours by carrying them to the furnace fire, or to fires placed at the outlet of hoods which cover the pans. In cases where inflammable spirit is used to a large extent in certain manufactures, as in making American cloth, the difficulty of dealing with the vapour is exceedingly great, as it is dangerous to pass it through a furnace fire for fear of explosions. In one factory with which I am acquainted, the quantity of petroleum spirit used daily in the thinning of the oil for the colours is not less than 140 gallons, all of which is daily evaporated from the cloth in the drying-room, which is gradually raised to a temperate of 130° Fahr., at which it is kept for six hours during the drying of the colours. In these cases it is best to ventilate the room freely by special shafts communicating with the chimney at a point where the vapours are not likely to be fired.

Fat-melting, bone-boiling, tripe-dressing, and the cooking of sheeps heads, bullocks cheeks, livers, and feet, as well as the boiling of shell fish, lobsters, and crabs, are all offensive operations, and require to be conducted in closed coppers, ventilated by special flues, which carry the organic vapours into the fires beneath them.

Akin to these are the processes for making size and glue. All sorts of gelatinous materials, as fresh English fleshings (cuttings of hides) from tanneries, kip fleshings from abroad, calves pates, and the cuttings of skins called "hide pieces," dried sinews, sloughs (bones inside horns), with other such offal and garbage, as well as fresh bones, are the raw materials from which size and glue are made. The fresh fleshings, as well as the clippings of others which contain fresh lime, are steeped for several hours in water acidulated with sulphuric acid. Old fleshings, in which the lime, is killed by becoming carbonate, are merely washed with water; and these with the other glue-making materials are put into large open boilers, called "glue-pans," with water, and are boiled for two or three hours by a naked fire, when glue is made, or by means of a steam coil, when size is the product, until they are dissolved. They are frequently stirred during this operation, in order that the fat may rise for collection. The liquid is then run off through a rough strainer into a tank, and allowed to settle for about half an hour, when it is either put into tubs and sent away as size, or it is allowed to set in wooden troughs, from which it is taken and cut up into blocks, about a foot square, which are subsequently further divided by means of a wire into slabs, and dried. The degree of concentration in making size is much less than that for glue, the point in the latter case being determined by the appearance of the cooked liquor upon a lump of alum. The residue in the glue-pans is a mass of fibrous matter, called "skutch," which often contains enough fat to pay for another operation. The skutch is put into a boiler with enough sulphuric acid to dissolve the fibre (about 75 lbs. to a ton of skutch), and it is heated by high-pressure steam blown into it. Under this treatment the fibre dissolves, and so lets loose the fat, which rises to the surface. All these operations are offensive, and require to be managed with great care to prevent them from being a nuisance. The fleshings and other materials, for example, are frequently allowed to remain in heaps in hot weather until they putrify, and the vapours from the glue-pans and the skutch-pans are exceedingly nauseous. It is proper, therefore, that the raw material should be used as quickly as possible, or be kept in covered tanks, and the vapours from the covered pans should be conveyed through condensers or coolers, and thence to the furnace fires.

Manure Making.—Apart from the making of superphosphate of lime, which I shall describe directly, the manufacture of animal manure is generally a frightful annoyance, from the circumstance that it is generally in the hands of small capitalists, who have very little regard for the health or comfort of the community. The raw materials are of the most heterogeneous character; as fleshings, breakings, and other refuse from tanners, felmongers, soap-makers, fat-melters, bone-boilers, glue-makers, &c., together with all sorts of waste from furriers, wool-spinners, hair-dressers, &c.; putrid fish, putrid flesh, and the offal of markets and slaughter-houses; all of which are indiscriminately used as the basis of animal manures; and these are treated in vats or boilers with sulphuric acid and steam, there being rarely much provision for the destruction or neutralization of the offensive vapours. Occasionally the operations are conducted in closed iron cylinders set vertically; so that the charge may be dropped into them at the top, and let out at the bottom. When full they are made tight, and submitted to the action of high-pressure steam (from 30 to 50 lbs.), which is blown into them for ten or twelve hours. In this manner the materials are perfectly desintegrated, and after standing for a few hours to cool, the liquid portions, consisting of water and fat, are first run out through a tap at the bottom, and then the solid parts are removed. Apparatus of this kind can be worked without annoyance to the neighbourhood; but if the manufacturer prefers to mix his materials in his owh way, it should be done in a close chamber or cylinder with revolving arms, and with a contrivance for carrying the offensive gases to the furnace fire. Other operations, as fish drying and smoking, and the preparation of albumen from blood and eggs, also deserve notice as requiring attention and cleanliness to guard against nuisances.

Animal Charcoal Burning.—This until lately was a great annoyance to the inhabitants of the neighbourhood in which sugar bakers reside. Formerly the bones were burnt in iron retorts set in a furnace, without much precaution against the escape of the offensive empyreumatic vapours; and the red-hot charcoal was cooled, and quenched in iron boxes by means of water, whereby much sulphuretted hydrogen was evolved. The processes, however, at present in practice are planned with every consideration for the public comfort. The retorts are so constructed that the vapours from the ignited bones are carefully conducted to the furnace fire, and burnt, and the red-hot bone block is received into specially designed coolers that do not permit of the access of atmospheric air, which would be destructive of the carbon of the bones. When the animal charcoal has become exhausted of its decolourizing power, it is again burnt, and revivified in revolving retorts, or in well-designed vertical cylinders, which do not permit of the escape of any offensive matter into the surrounding atmosphere, but discharge it into the furnace fire.

The roasting of coffee, chicory, and cocoa, if not properly managed, is offensive. The operation is performed in a revolving cylinder, a cage set over a coke or charcoal fire enclosed in a tight chamber, which is ventilated to the chimney shaft. In the case of coffee and cocoa, the roasting operation is often performed in wire cyliaders, whereas that of chicory, on account of the large quantity of powder produced, is always of sheet iron. The cylinders are about 4 feet long and 20 inches in diameter. They receive about a hundredweight at a charge, and they are run into the roasting chamber upon a square axle, which supports them over the clear fire, about a foot above it. They are then set in gear, and turned by machinery at the rate of about fifty revolutions a minute. There are breaks in the interior of the cylinder to distribute the coffee or chicory during the roasting, so as to equalize the action. The operation lasts about thirty or thirty-five minutes for coffee or chicory, and half the time for cocoa; and the empyreumatic vapours go into the fire and up the chimney shaft. When the operation is finished, in the case of coffee and cocoa, the roasted berries are cooled by a blast of air, and this blows about a quantity of the outer covering of the coffee berry (called 'flights), which are occasionally annoying to the neighbourhood. The loss of weight during these operations is from 14 to 16 per cent. for coffee, from 9 to 11 per cent. for cocoa, and about 25 per cent. for chicory. Brown malt and roasted corn are likewise roasted in much the same manner, and require that the empyreumatic vapours should be carried into the fire and be burnt.

There is another vegetable matter which in burning has lately caused offence to the neighbourhood in which the operations are conducted. This is the resinous matter obtained by the evaporation of the alkaline liquor obtained in the treatment of Esparto grass, and straw in paper-making. The liquor is first evaporated in large close evaporating pans, which receive the full force of the fire above and below, and thus the vapours are carried forward into the chimney shaft. When the residuum is sufficiently consolidated, it is roasted in a furnace, for the purpose of burning off the organic matter, and recovering the alkali. This operation has been forced upon the paper makers in consequence of the difficulty of disposing of the spent liquors.

Within the last ten years a new branch of industry has sprung up in this country, on account of the permission to use sugar as well as malt in the production of beer. The sugar is called saccharine, or glucose, or grape sugar, and it is generally made from the cheapest and most accessible kinds of starch. Rice starch is that which is commonly used in this country at the present time. The rice is crushed between rollers, and macerated in a vat with a little alkali for about twelve hours, during which time it is constantly stirred by revolving arms moved by machinery. In this manner the gluten of the rice is dissolved out of it, and the starch is see free. After standing quiet for about six hours the starch settles, and leaves a supernatant solution of gluten, which is generally thrown away. The starch is then transferred to another vat, and treated with water acidulated with sulphuric acid. About 150 lbs. of acid (sp. gr. 1850) and 1500 gallons of water are sufficient for a ton of starch. The mixture is stirred like the last, and it emits a smell of rancid butter and grains (butyric and lactic acids). It is then run into a vertical cylinder, called a "digester," where it is submitted to the action of steam, at 20 lbs. pressure, blown into it for about half an hour. This converts the starch into glucose, and the solution is allowed to flow into a vat, where it is neutralized with powdered chalk, and kept stirred for about two hours, during which time the same offensive smell of butyric and lactic acids is evolved, and to a much greater extent. The clear liquor is next filtered through horsehair bags to separate sulphate of lime, and evaporated *in vacuo* to the consistence of a very thin syrup, which is filtered through animal charcoal in the usual way. It is then further evaporated *in vacuo* until it looks like honey. In this state it is poured into moulds, and allowed to set. The yield of starch from the rice is as much as 80 per cent., and the yield of sugar is about 5 per cent. above the weight of the starch. The saccharine or grape sugar, when well made, contains from 80 to 82 per cent. of glucose, with only a trace of gum and mineral matter; and it is generally used by the brewer mixed with two parts of malt. The offensive effluvia from these operations are easily prevented by covering the vessels and ventilating them into the fire or chimney shaft.

Leaving these, which are the most important operations whereby sulphuretted hydrogen and organic vapours are evolved, I proceed to a class of manufactures which are nuisances by reason of the irritating acid vapours and gases which they produce; and these may be classified under different heads.

1. *Those which generate muriatic acid gas.* Until comparatively recently (since 1863, when the Alkali Act came into operation), the production of carbonate of soda, or rather salt-cake, which is the first step of the process of manufacture, was one of the most offensive and destructive operations in the kingdom. For a distance of miles, indeed, around the alkalia works, vegetation was blasted, and residential existence was almost impossible. Action upon action at law, therefore, for ruinous damages, was the chief entertainment of the parties concerned, and it was a dire struggle between the farm and the factory. The effect of all this was so seriously considered by the late Earl of Derby, that he brought it before the notice of Parliament, and obtained the Act of 1863, which compelled the manufacture of alkali to condense no less than 95 per cent. of all the muriatic acid derivable from the materials which were used; and last year the Act was amended so as to bring other manufactories, as copper-works, where salt is the agent employed, as well as vitriol-works, &c., under the Act. The amount of muriatic acid escaping from the alkali-works is also restricted, not merely to 5 per cent. of the quantity made, but to one-fifth of a grain per cubic foot of the gas or air leaving the works. There is hope, therefore, that still further improvements will be effected in these operations.

The method of making salt-cake is first to treat common salt with sulphuric acid in pots (called saturating pots) at the head of a reverberatory furnace, and then to rake out the mixture upon the bed of the furnace, where it is subjected to a red heat for two or three hours. The muriatic acid, which is copiously evolved from the materials, is carried by pipes and flues to a high and capacious condensing tower, where it meets a stream of cold water flowing downwards over the coke with which the tower is packed. The draught of the tower is caused by the furnace shaft, into which the residuum of unabsorbed gas enters. In this way a liquid acid of 28 Twaddel (sp. gr. 1140) is obtained, and this is used with oxide of manganese for making chloride in the production of chloride of lime (bleach powder). The red-hot salt-cake, when drawn from the furnace into iron barrows, is highly charged with muriatic acid, which it gives off in copious fumes, so that the workmen are obliged to take some precaution to prevent its effects. The fumes, however, do not extend to any great distance—not many yards from the furnace—and they might be checked altogether by Dr. Roscoe's contrivance of raking the hot furnace charge of salt-cake into a brick chamber underneath the furnace, and provided with an opening into the flue. All these arrangements are, however, under the immediate supervision of inspectors appointed by Government, and they are generally managed with great precautions.

Not so careful, as a rule, are the manufacturers who extract copper from spent pyrites by means of common salt. The iron pyrites used by the oil of vitriol maker in generating sulphuric acid contains from 2 to 4 per cent. of sulphur, and a small proportion of copper. They are crushed into a coarse powder, and mixed with common salt (3 cwt. to a ton of pyrites), and they are roasted in a reverberatory furnace for several hours, whereby muriatic acid gas and a little sulphurous acid escape; and as the manufacturers have not hitherto been under any legislative obligations as regards the proportion of acid evolved, they have generally let it go freely into the chimney shaft. They will, however, be compelled to condense it by means of coke towers, as is done in alkali works.

Common bottle glass is now made from silica and common salt, which are fused together in huge melting-pots, and thus immense quantities of muriatic acid gas are discharged into the air.

In like manner the use of common salt as a means of glazing the commoner kinds of pottery (brown ware bottles, jugs, pans, pipes, &c.) is a cause of great offence at Lambeth and elsewhere, from the amount of muriatic acid discharged into the atmosphere.

Brick-burning and cement-burning are also sources of nuisance from the same cause. In the case of bricks, the salt comes from the cinders (household breeze) used in the burning, which become charged with salt in the dust-bins of houses. In the case of cement-burning, the salt is derived from the mud of the tidal rivers, from which, with chalk, the cement is made. In all these instances, when salt is heated with silica or clay, the alcali combines with the fixed acid, and forms a fusible glass or glaze, while the volatile acid (muriatic) escapes. The remedy with the potter and cement manufacturer is to condense the fumes in a proper scrubber; and with the brick maker the remedy is to use coke breeze or household breeze that has been well weathered, and washed by the rain.

2. Nuisances occasioned by the escape of sulphurous acid. This is most marked in the manufacture of oil of vitriol, which is always produced from the

vapours of burning sulphur. The sulphur employed is either crude native sulphur or pyrites (which contains from 35 to 50 per cent. sulphur), and the spent oxide from gas-works (which is a mixture of from 40 to 60 per cent. sulphur with hydrated oxide of iron and sawdust). The furnaces for burning these several forms of sulphur are very different in their contruction, but when properly managed the combustion of the sulphur should be complete, or nearly so, and all the fumes should be carried, without escape, into the leaden chambers. These chambers are of great capacity, as from 30,000 to 100,000 cubic feet, and they not only receive the fumes of the burning sulphur (sulphurous acid), but they likewise receive nitrous fumes from a pot or small stove containing nitre at the back of the sulphur furnaces, as well as jets of steam, which are blown into the chambers from a boiler. The chemical reactions which take place in the chamber are not precisely understood, but the practical effect of them is that the sulphurous acid or anhydride (So_2) with nitrous fumes ($N_2 O_3$) and steam or water ($H_2 O$) form sulphuric acid ($H_2 So_4$), and nitric oxide ($N_2 O_2$). The former is precipitated to the bottom of the chamber, where it is dissolved in the water present, and the latter (nitric oxide) escapes to take oxygen from the air of the chamber, and so again forms nitrous fumes for a similar reaction. The nitrous fumes, therefore, are merely the purveyors of oxygen from the air to the sulphurous acid, and would, in the presence of oxygen alone, act indefinitely; but as the oxygen of the air in the chamber is associated with nearly four times its volume of nitrogen, it follows that as the former is abstracted the latter accumulates, and must be replaced by fresh atmospheric air. Hence the necessity for a current of air through the chambers, and this current of air carries with it notable proportions of sulphurous acid and nitric oxide, which, escaping into the atmosphere by the chimney shaft, are the cause of injury to vegetation, and annoyance to the neighbourhood. The extent of this escape of noxious gases may be determined in several ways:—First, the relation between the quantity of materials used, and the amount of oil of vitriol produced. Theoretically, 100 parts of sulphur should produce 306·25 parts of monohydrated sulphuric acid ($H_2 So_4$); but in practice it varies from 200 to 294 parts. The nitre also employed at the works ought not to exceed 2 parts by weight for every 100 parts of sulphur; but in reality it is rarely less than 4 parts, and it ranges from this to 12 parts or more. In those cases where spent oxide is used as a source of sulphurous acid, the quantity of nitre is rarely less than 7 per cent. Secondly, the amount of escape may be ascertained by examining the gases which pass from the chambers to the chimney shaft. There is always a means of doing this with considerable accuracy by abstracting the gases from the flues which connect the chambers with the general shaft. According to Dr. Roscoe, a cubic foot of these gases ought not to contain more than one grain of sulphur in any form; whereas, in badly managed works, the quantity may reach to 16 grains per cubic foot. The air of the chimney shaft also should not contain more than a quarter of a grain of sulphur per cubic foot, and of this a little more than half is derived from the coke or coal burnt in the furnaces. The remedies for this waste are twofold:— 1. The exercise of care in the conduct of the works—regulating the sulphur furnaces so that no fumes escape therefrom, and a proper supply of air is admitted into the chambers. In well-managed works it is customary to have glass pressure syphons communicating with the exterior of the various chambers, so as to watch and regulate the condition of them. The chambers also should be completely surrounded, and enclosed with casing, having a gallery or passage way around, so that any and every escape may be at once detected. 2. The effluent gases should be passed through scrubbers charged with absorbent liquids. Oil of vitriol, for example, flowing through the scrubber in a small graduated stream, will absorb the oxides of nitrogen, as suggested by Gay Lussac; and water will take up any trace of sulphurous acid. Both of these liquids can be made to flow into the leaden chamber, and be thus utilized. At several oil of vitriol works which I have inspected, it is the practice to carry the gases, which may by accident escape from these absorbent agents, through a lime purifier, before they go to the tall chimney shaft; and in this way all chance of annoyance is prevented.

The sulphuric acid which collects at the bottom of the leaden chamber is continually drawn off at a specific gravity of 1600. This is called "chamber acid," and as it is too weak for general purposes, it has to be concentrated by evaporation. This is done to a certain extent in leaden pans, where it reaches a gravity of about 1720, making the "brown acid" of commerce; and the further concentration is effected in vessels of platinum or glass, where the acid obtains a gravity of from 1845 to 1854, which is the "oil of vitriol" of English commerce. All of these operations are offensive, from the escape of acid, unless they are well managed.

It is necessary, therefore, in the management of oil of vitriol works, to take care—1. That the sulphur furnaces are burning properly, and are not permitting any escape of sulphurous acid. 2. That the leaden chambers and flues therefrom are constantly sound and air-tight. 3. That the gases in the flues from the leaden chamber do not contain above one grain of sulphur per cubic foot. 4. That these gases are passed through a water scrubber and an oil of vitriol scrubber in succession, before they go to the chimney shaft. 5. That the evaporation and concentration of the chamber acid, as well as the brown acid, be conducted without the escape of offensive gases. Another source of annoyance from the escape of sulphurous acid is where the noble metals are refined by boiling the alloys in oil of vitriol. This, however, is easily guarded against by conducting the operations in closed vessels, and carrying the evolved gases through an alkaline solution, whereby valuable sulphites and hyposulphites may be obtained for commerce. And, lastly, there is often a considerable escape of this gas from the chambers where bleaching operations are carried on by means of burning sulphur, as for example in the bleaching of woollen goods, straw bonnets, hair, hops, nuts, spice, &c.; and in these cases the refuse gas should be carried through some absorbent liquid or solid (lime, for example) by means of a fan or draught, to a chimney.

3. There are certain manufacturing operations which are attended with the escape of nitrous fumes, and are exceedingly irritating and offensive. As I have stated, these fumes may escape from badly managed vitriol-works. They are also caused when oxalic acid is produced from saccharine matters by the action of nitric acid. Refiners also discharge large quantities of the acid into the air when they treat the alloys of the noble metals with nitric acid. The makers of tin and iron liquors, of nitro-benzole, and of picric acid, are likewise producers of these irritating fumes when they act upon the several materials with strong nitric acid The remedy for the nuisance is the carrying on of such operations in closed vessels, and the conveyance of the nitrous fumes through water or an alkaline liquid (milk of lime), by which the red fumes are entirely absorbed or arrested.

In the manufacture of bleach powder (chloride of lime) there is occasionally an escape of chlorine, but it is nearly always accidental, unless the works are managed with great carelessness. The chlorine is generally made from the liquid muriatic acid, which flows from the condensing towers at the alkali-works. The acid has a gravity of from 25 to 28 Twaddel (1125 to 1140), and it is run into a still upon peroxide of manganese, and stirred and heated so as to promote chemical action. The chlorine which is thus evolved is passed into chambers containing layers of finely slaked lime, slightly damp, to the depth of from 3 to 6 inches. The residual liquor in the still, which is a solution of chloride of manganese and free acid, of the strength of from 26 to 30 Twaddel, is, in many cases, not allowed to run to waste, and be a cause of annoyance, but is treated with lime and air to recover the oxide of manganese. The first step of the process is to neutralize the free acid of the liquor by means of chalk (carbonate of lime), which does not decompose or act upon the chloride of manganese. When the effervescence is over, and the liquor has become clear by subsidence, the supernatant solution of chloride of manganese and chloride of calcium is drawn off into another vessel, called an "oxidator," where it is subjected to the action of a proper proportion of cream or milk of lime, which decomposes the chloride of manganese, and forms a precipitate of oxide of manganese. Air is now blown into the mixture until the protoxide of manganese is converted into peroxide, and when this is complete it is allowed to settle, and the solution of chloride of calcium is either utilized or is run away to waste. Chlorine is also made from gaseous muriatic acid by the oxidizing action of the air at a high temperature. In this case the muriatic acid gas from the salt-cake furnaces is carried with atmospheric air into chambers heated to a low red heat (about 1000° Fahr.), and here, and in another chamber called an "oxidator," the hydrogen of the muriatic acid is oxidized, and the chlorine set free. The mixed gases and vapours of chlorine, muriatic acid, and steam, are passed through condensers to cool them, and the moist chlorine is finally dried in a sulphuric acid scrubber, and then conveyed to the lime chambers. This method of generating chlorine requires care and attention, as the high temperature of the decomposing apparatus is very likely to lead to fissures and cracks in the apparatus, which will permit an escape of irritating gases.

The last of the acid nuisances to which I shall refer is that caused by the manufacture of superphosphate of lime. In the early days of this branch of industry, it was the practice to make superphosphate of lime by mixing chamber acid, a little diluted with water, with ground coprolites, bones, and animal refuse of all kinds, by means of a shovel and an open trough. The fumes of acrid gases and vapours which were thus freely evolved into the air were extremely offensive to the neighbourhood. At present the mixture is effected in a closed vessel, in which a stirrer revolves horizontally. The best form of mixer is about 10 feet long and 4 feet in diameter, with a stirrer, which, with its arms, revolves horizontally. The materials which are used in the manufacture are ground coprolites, crushed bones, spent animal charcoal from sugar refiners, and animal refuse of all kinds. These are put into the mixer in proper proportions, and treated with water and sulphuric acid. The mixer has an upper opening for the admission of the materials, and a lower one for the exit of them. Both of these openings are secured with covered air-tight valves; and during the mixing, which lasts from five to ten minutes, the materials evolve vapours charged with organic fumes, and the acrid and exceedingly irritating tetra-fluoride of silicon, which is produced by the action of sulphuric acid upon the fluorides and silicates contained in the coprolites. These gases and vapours are conveyed from the mixer by a special shaft or flue, which carries them first to a chamber, in which they meet a copious spray of water, and then through a coke scrubber or condenser, furnished with a fine stream of water; and, lastly, in some cases, through a lime purifier before they reach the furnace shaft. When the materials are thoroughly incorporated in the mixer, they are discharged through the lower opening into the chamber or den, in which, in the course of 24 hours, they consolidate. This chamber should also be air-tight, and ventilated into the same shaft or flue which carries the gases from the mixer to the condenser. If these operations are properly managed, they may be conducted without other offence, to the neighbourhood than the faint acid smell which is inseparable from the exposure of the consolidated superphosphate; but if they are not well designed and managed, they are the cause of insufferable nuisance. The object of having a fine spray of water, as the first absorbent of the acid gases, is that the tetra-fluoride of silicon is immediately decomposed when it comes into contact with water, forming the hydrate of silica, which is deposited in a pulpy form, and an acid called hydrofluosilicic acid, which the water dissolves. Now, if this were to take place in a scrubber packed with coke and supplied with downward flowing water, this hydrate of silica would soon clog the pores and apertures of the scrubber, and throw it out of action. Hence the necessity for decomposing the tetra-fluoride of silicon in a chamber before it reaches the coke scrubber.

And now, in concluding this brief outline of the processes which are most likely to receive attention from medical officers of health, I may summarize the recommendations which I have ventured to submit, as the best means of abating the nuisances referred to, by saying—1. That all noxious and offensive operations should be carried on, as far as possible, in air-tight chambers, which can be ventilated by means of fans, or by the chimney draught. 2. That all condensable and absorbable gases and vapours should be passed through condensers and absorbents best suited for their absorption—as water in spray, and scrubbers charged with water, oil of vitriol, or alkaline solutions. 3. That, when necessary, these scrubbers should be supplemented with special purifiers, as hydrated oxide of iron, hydrate of lime, &c. 4. That organic vapours and sulphuretted hydrogen and empyreumatic matters should be conveyed to the furnace fire and destroyed. In carrying out this part of the process, it is necessary that all steam should be condensed from the vapours, by cooling them thoroughly before they reach the fire, as otherwise the fire is apt to be put out by them. The fire which is best suited for this purpose is that which is actually used in manufacturing operations, as special fires are very likely to be neglected; and the best place for the entrance of the noxious vapours is at the back of the ash-pit immediately under the fire-bars, as by this means a draft is secured (by closing the ash-pit), and the vapours ar emade to pass through the glowing coals of the fire. 5. All offensive materials should be brought to the works, or carried away from them, in properly constructed carts or tanks, which can be closely covered; and all such material, when stored at the works, should be kept in close tanks or chambers, ventilated, when necessary, to the scrubbers or furnace fire. And, lastly, the whole of the operations should always be managed with care and attention to details—there being no neglect of the sound condition of every part of the plant or working apparatus.

With these precautions, which are by no means unreasonable or impracticable, the manufacturer of offensive products might generally so conduct his operations as not only to protect the public from annoyance, but also to secure his own interests by preventing unnecessary waste.

It will be observed that I have not dealt with the question of nuisances from the slaughtering of cattle, &c., as this has already received attention from the society, through the labours of our colleague, Dr. Dudfield; and that our recommendations on the subject have been accepted by the Metropolitan Board of Works.

In conclusion, I trust that I may soon be able to find time for a further treatment of the subject, by describing the nuisances which arise from the second and third causes alluded to at the beginning of the paper.

Burslem Gas Supply.—At the meeting of the Burslem Local Board on the 3rd inst., the gas examiner (Mr. T. Blackshaw) reported that the illuminating power of the gas had been satisfactory during the month of January, except on two evenings, when it was below the requirements of the Act. Sulphur had been present to the extent of an average of 20·26 grains (Letheby test) per 100 cubic feet of gas. Sulphuretted hydrogen had been entirely absent, and other sulphur compounds had been greatly reduced in amount. A proposal to purchase the works of the company was submitted by Mr. Hulme, seconded by Mr. Parker, and carried, the arrangements of all the necessary details being left to a committee. The clerk read a letter from the Penrith Local Board, asking the board to support a bill for authorizing the purchase of gas-works by local authorities. Mr. Woodall characterized the suggestion as ingenious as that of the Home Rulers, and ridiculed the idea of the board joining in a memorial of so absurd a character. No action was taken in the matter.

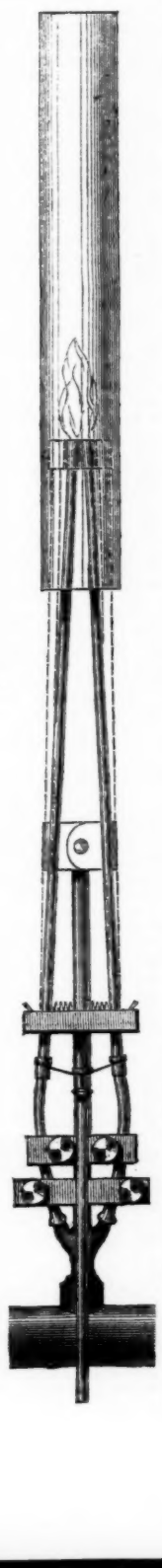
M. KASTNER'S NEW MUSICAL INSTRUMENT, THE PYROPHONE.

At the Evening Meeting of the Society of Arts, London, on Wednesday last—Lieut.-Colonel STRANGE, F.R.S., in the chair—a paper prepared by M. Dunant, giving a description of the Pyrophone, was read by the secretary, Mr. P. LE NEVE FOSTER.

The CHAIRMAN, in introducing the subject, said the paper related to a peculiar musical instrument, which was the result of some of the latest researches in physical science, and afforded an additional proof of the alliance which existed between high science and the useful arts. The discovery of the principles which led to the construction of this instrument was due to M. Kastner, a young French gentleman of property, who had devoted himself to scientific pursuits, and who had sent the instrument to be exhibited that evening.

The SECRETARY said the instrument had been expressly made by M. Kastner for the instruction of the present audience. M. Kastner had in Paris an instrument of a much larger size and compass, having about 120 tubes and three key-boards, which had been applied with very great effect at some concerts in the French capital. The instrument now exhibited was a very small one, having only one octave, and it had been sent over entirely at M. Kastner's own expense, in charge of a French gentleman, M. Dunant, who had spent two days in putting it together since its arrival. He might add, that M. Kastner wished the society to look at his invention not as an already perfected instrument, but as one which he believed would ultimately be of great value to the musical world. He then read the paper, the principal portions of which are subjoined.

Sound is in general, according to natural philosophers, a sensation excited in the organ of hearing by the vibratory movement of ponderable matter, whilst this movement can be transmitted to the ear by means of an intermediate agent. Sound, properly called musical sound or tone, is that which produces a continuous sensation, and of which one can appreciate musical value. Noise is a sound of too short a duration to be appreciated well, as the noise of a cannon, or else it is a mixture of confused and discordant sounds like the rolling of thunder. For a single sound to become a musical sound—that is to say, a tone corresponding to one of the intonations of the musical scale—it is necessary that the impulse and, consequently, the undulations of the air should be exactly similar in duration and intensity, and that they should return after equal intervals of time. In its change to the musical state, however dull and confused the noise may be, it becomes clear and brilliant. Like the diamond, after having been polished and cut according to the rules of art, it has the brilliancy for the ear which the former has for the eye. This is what takes place in singing flames. Very imperfect in its beginning, hoarse, roaring, or detonating, it does not come nearer the musical sound, properly so called, in the chemical harmonica, as it is termed, still, by means of reiterated trials, the sound of the single flame in the tube, the *lumen philosophicum*, as it is elsewhere called, can be musically produced in every case.



It has long been known that a flame traversing a glass tube under a certain pressure produces a musical sound. The eminent *savant* Professor Tyndall, to whom the greater part of the deep questions in physics are not mysteries, has studied singing flames, but it must be admitted that singing flames have only penetrated into the dominion of art in consequence of the discovery made by M. Frederic Kastner, of the principle which allows of their being tuned and made to produce at will all the notes of the musical scale. To stop the sound instantaneously and mechanically, as in keyed instruments, the sound is regulated and subdued as desired. It is thus that the modest *harmonica chimique*, *lumen philosophicum* of natural philosophers, has, in the pyrophone, attained to the character of a real musical instrument. This happy result supports the remark that the observation in nature of the phenomenon of sound may conduct man, if not exactly to the invention of music, at least to endow the art with resources which increase its power.

The sound of the pyrophone may truly be said to resemble the sound of a human voice, and the sound of the Eolian harp; at the same time sweet, powerful, full of taste, and brilliant; with much roundness, accuracy, and fulness; like a human and impassioned whisper, as an echo of the inward vibrations of the soul, something mysterious and indefinable; besides, in general, possessing a character of melancholy, which seems characteristic of all natural harmonies.

Professor Tyndall has recognized the fact that in order to render a flame musical, it is necessary that its volume be such that it should explode in unison with the undulations of the fundamental note of the tube, or of one of its harmonics. He also asserts, that when the volume of the flame is too great, no sound is produced; he demonstrates it by increasing the flow of gas. Professor Tyndall has also called attention to this fact, that in order that a flame may sing with its maximum of intensity, it is necessary that it should occupy a certain position in the tube. He shows this by varying the length of the tube over the flame, but he does not specify the proportions which must exist between the flame and the tube for obtaining this maximum intensity of sound. M. Kastner's merit is in having shown that when two or several flames are introduced in a tube, they vibrate in unison, and produce the musical maximum of sound, when they are placed one-third the length of the tube, and if these two flames are brought in contact, all sound ceases directly—a phenomenon M. Kastner demonstrates to be caused by the interference of vibrating flames. Here is a question, lately scarcely thought of, of which M. Frederic Kastner has determined the laws, at the same time making a most remarkable application of them in creating an instrument which reminds one of, and may be mistaken for, the sound of the human voice.

A very simple mechanism causes each key to communicate with the supply-pipes of the flames in the glass tubes. On pressing the keys the flames separate and the sound is produced. As soon as the fingers are removed from the keys the flames join, and the sound ceases immediately. These new experiments, made by M. Kastner upon singing flames, should cause all makers of musical instruments to turn their attention to inventions connected with sound. If two flames of suitable size be introduced into a glass tube, and if they be so disposed that they reach one-third of the tube's height, measured from the base, the flames will vibrate in unison. This phenomenon continues as long as the flames remain apart, but the sound ceases as soon as the two flames are united. If the position of the flames in the tube is varied, still keeping them apart, it is found that the sound diminishes, while the flames are raised above the one-third until they reach middle point, where the sound ceases. Below this point the sound increases down to one fourth of the tube's length. If at this latter point the flames are brought together the sound will not cease immediately, but the flames will continue to vibrate as a single flame would.

M. Kastner, for his first experiments, used two flames derived from the combustion of hydrogen gas in suitably constructed burners. The interference of the singing flames is only produced under special conditions. It is necessary that the length and the size of the tubes depend upon the number of flames. The burners must be of a particular shape; the height of the flames does not exercise much effect upon the phenomenon. From a practical point of view, the whole of the experiments effected by M. Kastner after several years, have resulted in the construction of a musical apparatus of an entirely new principle, to which he has given the name of Pyrophone. It may be called a new organ, working by singing flames, or rather by vibrations caused by means of the combustion of these flames. This instrument may be constructed from one octave to a most extended compass.

The *British Review* humorously remarks that the pyrophone will naturally be valuable in winter, and that in America it has already been recommended to families as a means of warming small apartments, and perhaps an economical stove may be added to it for the culinary exigencies of straitened households.

The pyrophone will have in the future a poetical mission to fulfil in the music of concerts. A great number of composers and musicians have already admired this new organ performing by the singing of flames, or rather by the vibrations determined by means of the combustion of these flames. They think it will be of great advantage in cathedrals and churches, as the most extended compass can be given to the instrument.

L'Année Scientifique, by M. Figuier, declares that the pyrophone is assuredly one of the most original instruments that science has given to instrumental music. In the large pyrophone which M. Kastner has constructed, and which they have not yet been able to bring to London, an artist can produce sounds unknown till the present time, imitating the human voice, but with strange and beautiful tones, capable of producing in religious music the most wonderful effects. So says *Le Journal Officiel de l'Exposition de Vienne*.

Journals and reviews abroad have unanimously mentioned with praise this new instrument, both from a musical as well as from a scientific point of view.

M. Henri de Parville, in *Les Causeries Scientifiques*, gives a large space to the consideration of "Singing Flames," and states that gas music made its *début* at the Vienna Exhibition of 1873. *Nature* and *La Revue des Sciences*, edited by M. Tissandier, believes that this new instrument is destined to produce the most remarkable and unexpected effects in the orchestras of lyric theatres and in large concerts. The chandeliers of the theatre, besides serving to light it, may be converted into an immense musical instrument:—

"When the pyrophone is played by a skilful hand, a sweet and truly delicious music is heard; the sounds obtained are of an extraordinary purity and delicacy, recalling the human voice."

The inventor has prepared a large and beautiful singing lustre, with a dozen or fifteen jets, which can be placed in the richest or most comfortable drawing-room. This lustre may be used at concerts or balls, for on it can be played all the airs in dance music. It will be worked by electricity, so that the performer who plays may be seated in a neighbouring room. The effect will be perfectly magical. The future has other surprises for us for our houses. The most unexpected applications of scientific principles are daily the result of the skilful efforts of learned men.

Without reckoning Professor Tyndall, who is so well known and esteemed on the Continent, many other learned men, English, German, Austrian (like Shaffgotsche), and Frenchmen have already studied singing flames, but no one had previously thought of studying the effects produced by two or several flames brought together, till M. Kastner, who, by means of delicate combinations and ingenious mechanism, has produced this instrument.

On the 17th of March, 1873, the Baron Larrey, member of the Academy of Sciences of Paris, presented to l'Institut de France young Kastner's first memoir on singing flames, which laid down the following new principle:—

"If two flames of a certain size be introduced into a tube made of glass, and if they be so disposed that they reach the third part of the tube's height (measured from the base), the flames will vibrate in unison. This phenomenon continues as long as the flames remain apart; but as soon as they are united the sound ceases."

Passing on to his experiments, M. Kastner thus give his own account:—

"I took a glass tube, the thickness of which was 2½ millimètres; this tube was 55 centimètres long, and its exterior diameter measured 41 millimètres. Two separate flames of hydrogen gas were placed at a distance of 183 millimètres from the base of the tube. These flames, while separated, gave F natural.

"As soon as the flames are brought together, which is done by means of a very simple mechanism, the sound stops altogether. If, letting the flames remain apart, their position is altered until they reach one-third of the total length of the tube, the sound will diminish gradually; and it will cease completely if the flames go beyond one-half the length of the tube; below this (one-half the length of the tube) the sound will increase until the flames are brought to one-fourth of the tube's total length. This latter point being reached, the sound will not cease immediately, even if the two flames are placed in contact one with the other; but the two flames, thus united, continue vibrating in the same manner as a single flame would.

"The interference of the singing flames can only be obtained under certain conditions. It is important that the length of the tubes should be varied according to the number of the flames, the height of which has only a limited action or influence over the phenomenon; but the special shape of the burners is a matter of considerable importance.

"These experiments, which I undertook two years ago, induced me to construct a musical instrument, possessing quite a novel sound, resembling that of the human voice. This instrument, which I term the Pyrophone, is formed by three sets of keys (*claviers*), disposed in a similar manner to that employed for the conjunction of the organ-key tables; a very simple mechanism causes every key of the different sets to communicate with the supply-pipes in the glass tubes. As soon as a key is pressed upon, the flames, by separating, create a sound; but when the keys are left untouched, the flames are brought together and the sound ceases."

In consequence of this communication, a commission from the Académie des Sciences de Paris was selected for the examination of this curious invention, consisting of Messrs. Jamin, Regnault, and Bertrand, three distinguished members of that academy, who showed a lively interest, from a scientific point of view, in M. Kastner's discovery. After fresh experiments, M. Kastner has succeeded in substituting the ordinary illuminating gas for hydrogen gas in working this pyrophone, and his friend, the Baron Larrey, was again the inter-

prater to the Académie des Sciences of this new discovery, which much facilitates the employment of the luminous musical instrument. M. Kastner thus expresses himself in his new memoir presented to l'Institute de France, Dec. 7, 1874:—

"The principal objection which has been made to the working of the pyrophone is the employment of hydrogen gas. From a practical point of view this gas presents several inconveniences. It is difficult to prepare; it necessitates the use of gasholders, whose size may be considerable. Besides, there is some danger in its use. I have therefore given up using hydrogen gas, and for a year past I have experimented on the means of applying common illuminating gas to the pyrophone, which it is always easy to procure. In the first experiments which I attempted with two flames with illuminating gas, in a glass tube, I was unable to obtain any sound, which proved unmistakeably the presence of carbon in the flames. Whilst the sound was produced in a very clear manner with the pure hydrogen gas—that is to say, without there being any solid foreign matter in the flames—it was impossible to make the tube with illuminating gas vibrate, when placing the flames in an identical condition. It was necessary, then, by some means or another, to eliminate the carbon, a result at which I arrived by dint of the following method:—

"When the flame of ordinary gas is examined, and this is introduced into a tube made of glass, or of any other material (metal, oilcloth, cardboard), &c., this flame is either illuminating or sounding!

"When this flame is only illuminating, that is to say, when the air contained in the tube does not vibrate, it presents a lengthened form, and is pointed at the top. Besides, it swells towards the middle, and flickers on the least current of air. On the contrary, when the flame is sounding, that is to say, when the necessary vibrations for the production of sound are produced in the tube, its form is narrow, and large at the top. Whilst the air of the tube vibrates the flame is very steady. The carbon in a great measure is eliminated as if by some mechanical means.

"Sounding flames proceeding from lighting gas are in effect enveloped in a photosphere which does not exist when the flame is merely luminous. In the latter case the carbon is burnt within the flame, and contributes in a great degree to its illuminating power.

"But when the flames are sounding, the photosphere which surrounds each of them contains an exploding mixture of hydrogen and oxygen which determines the vibrations in the air of the tube.

"To produce the sound in all its intensity, it is necessary and sufficient that the whole of the explosions produced by the particles of oxygen and hydrogen in a given time, should be in agreement with the number of vibrations which correspond to the sound produced by the tube.

"To put these two quantities in harmony, I have thought of increasing the number of flames so as to increase also the number of the explosions from the mixture of oxygen and hydrogen in the photospheres, and thus to determine the vibration of the air in the tube. Instead of two flames of pure hydrogen, I put four, five, six, &c., jets of lighting gas in the same tube.

"I have besides observed that the higher a flame is, the more carbon it contains.

"I have, then, immediately been obliged to diminish the height of the flames, and consequently to increase the number, so that the united surface of all the photospheres may suffice to produce the vibration of the air in the tube.

"The amount of carbon contained in the whole of the small flames, will always be much less than the quantity of carbon corresponding to the two large flames necessary to produce the same sound. In this manner I have been able with separated flames to obtain sounds whose tones are as clear as those produced by hydrogen gas. When these flames, or rather when the photospheres which correspond to these flames, are put in contact, the sound instantly ceases. The carbon of lighting gas, when the flames are sounding, is certainly almost entirely eliminated—in fact, it forms upon the interior surface of the sounding tube, at and below the height of the flames, a very visible deposit of carbon, which increases whilst the air of the tube vibrates. I can now affirm that the pyrophone is in a condition to act as well with the illuminating gas as with pure hydrogen. The phenomenon of interference is produced exactly in the same condition with the two gases, the same flames occupy the same position in the tube—that is, the third part of the tube's length, measured from the base. In addition to the phenomenon of interference, I believe I shall be able to describe a novel process by aid of which the sound produced by burning flames in a tube can be made to cease.

"Supposing that one or several flames, placed in a tube a third of its height (measured from its base), determine the vibration of the air contained in this tube; if a hole is pierced at the one-third of the tube, counted from the upper end, the sound ceases. This observation might be applied to the construction of a musical instrument, which will be a species of flute, working by singing flames. Such an instrument, from a musical point of view, will be very imperfect, because the sound will not be so promptly or sharply stopped as when the phenomenon of interference is employed. If, instead of making the hole at the third, it is made at a sixth, the sound will not cease, but it will produce the sharp of the same note. In all these experiments I have clearly detected the formation of ozone while flames cause the air in the tube to vibrate. The presence of this body can, moreover, be ascertained by chemical reagents scientifically known."—Given before the Académie des Sciences, Dec. 7, 1874.

At a lecture on the 13th of January, at the Royal Institution, Professor Tyndall showed experiments, according to the new principle, with an apparatus of nine flames, which worked during the evening in tubes of different sizes.

The instrument having been played upon by itself, and also in connexion with a piano,

The Chairman suggested that there were two points that admitted of debate; the first, as to the scientific principles involved in the production of sound; the second being the question of the quality of the sound when produced, and its utility as to our present musical means.

Mr. Blackie asked that, before discussion, there might be a trial of the instrument with a quicker kind of music.

The Secretary said quick music could not be played on it.

Mr. Blackie remarked that in the paper something was said about playing dance music on it.

The Chairman thought it was a purely mechanical question whether the separating of the jets could be effected more rapidly.

Mr. Piercy suggested that the pyrophone would have been a most interesting instrument before the discovery of the organ. He further observed that he thought it might possibly have a special use in lighthouses, for when the state of the atmosphere prevented the light of the flames being visible, the tubes might easily be adapted to produce a most penetrating and ponderous sound, so as to warn ships from the rocks.

Sir Julius Benedict asked whether there were any means in the instrument for regulating the intonation, for it seemed to him, in its present state, exceedingly faulty, and certainly the attempts to make the sounds correspond to those of the piano did not succeed. He thought, if the inventor could regulate the strength of the stroke, he might be able to regulate the quality also.

M. Dunant said that could be done.

The Secretary said the regular pressure of the gas was required to make the tones uniform, and if that was secured, there would be no difficulty in adjusting the instrument generally so as to harmonize in sound with any other instrument used with it.

Sir Julius Benedict remarked that there were vibrations that made the sound uncertain. There was not the same quality of sound throughout. It began flat, and got sharper. In an orchestra it was most desirable that there should be the same tone from the beginning to the end.

M. Dunant said that with a regulator there was no difficulty in producing a gradation of sound from beginning to end. The specimen of the instrument now exhibited was so rapidly put together that it was impossible to make this adjustment.

The Chairman said it must be remembered that, with regard to want of uniformity of tone in this instrument, the bellows of the organ was replaced by the gasometer, and the gasometer was not under the control of the performer as the bellows of the organ was. Consequently, the same regularity of pressure could not be expected as where the bellows was especially constructed to produce a uniform blast. It appeared that to the more perfect instrument in Paris a regulator was applied.

Mr. Wills said there could be no question of the great ingenuity displayed by M. Kastner in the construction of this instrument, but, if it were to be introduced as a practical instrument, it was as well that the difficulties to be overcome should be clearly stated. Having had some experience of sounding flames, the difficulties appeared to him to be these:—In the first place, the position of the burner in the tube was a matter of considerable importance; its size must be always the same, and its position, both vertically and laterally, must be fixed and absolute. Besides this, the gas used must be of definite quality, and perfectly under control. These points might each be secured singly, but, taking them in the aggregate, he doubted the possibility of making an instrument which should be practically useful. But, if this were accomplished, there was always the danger that when there were several pipes in close proximity, the sounding of one would start another, especially the harmonics or octaves of the particular notes, and this would, sooner or later, have to be met. Another difficulty was, that there was always a tendency in sounding flames to go out suddenly, when, of course, the sound would cease. Again, in an instrument of this kind, as it would be impossible to use "stopped" pipes, great length would be required for the lower notes, a 16-feet open pipe being required to produce the same tone as an 8-feet stopped pipe. This instrument was not quite new in principle. Professor Tyndall, some four or five years ago, exhibited an octave of pipes sounding with a flame, and he had been followed by others, himself among the number. No attempt, however, had been made to construct a musical instrument on this principle, because the difficulties he had mentioned appeared insurmountable. M. Kastner said the cessation of sound which took place when the flames were joined together was due to the interference of vibrations, but he doubted if this were the true explanation. The flame must be supplied with a certain quantity of air, in order that little explosions should be produced; and it was the rapidity of these explosions, the sound intensified by the column of air in the tube, which produced the musical sound. Now, if the jets were brought together, they produced one long flame only supplied with air on the outside, and to so limited an extent that an explosive mixture was not formed; but, when the flame was opened out, it formed a series of small flames, each of which was surrounded by air, forming the explosive mixture, and the tube spoke. M. Kastner was probably not a chemist, for his ideas with regard to the carbon in the gas seemed somewhat vague. He spoke of its elimination, by altering the position of the flame, as if it were a mechanical process; but such could not be the case; the only means of getting rid of the carbon being by burning it into carbonic acid, which was effected by allowing a sufficient amount of air to come in contact with the flame. The reason why the effect was not produced so well with coal gas as with hydrogen was, that in the former case a much larger quantity of air was required in order to produce an explosive mixture. Great credit was due to M. Kastner for having produced an instrument exhibiting so much ingenuity.

Mr. Mitchell said he should like to ask Mr. Wills if it were not the case that the difficulty of producing rapidity of execution was rather a physical difficulty than a mechanical one, as had been suggested by the chairman. The mechanism by which the jets were opened and closed seemed to work with tolerable rapidity, but from a recollection of Professor Tyndall's lectures at the Royal Institution, he fancied a certain appreciable time had always elapsed before the vibration produced the musical note. If this were so, he feared that the pyrophone, though a very interesting philosophical toy, would never be of much practical utility.

Mr. Wills said he agreed in the remarks of the last speaker.

The Secretary, in confirmation of what Mr. Wills had said, remarked that when the flame was in the form of a tall jet there was no vibration going on, but when the jets were separated these vibrations were visible. In order to get rapidity of action it would be requisite to separate the flames instantaneously, as to which there seemed a great difficulty.

Mr. Ford Goddard said he felt much interest in this subject, as during the last three years he had himself made several experiments in connexion with it. He had met with the difficulties which had been already mentioned, and though some of these had been overcome, there were others which seemed to increase rather than diminish. M. Kastner's instrument was certainly novel in construction, and had some fine points about it. The instrument which he (Mr. Goddard) constructed consisted only of 36 tubes, and was meant for use in a chamber or room, the sound produced by it not being sufficiently loud for other purposes. In fact, one of the main difficulties he experienced was to produce a sufficiently loud musical sound to be heard in a large apartment. M. Kastner had overcome the difficulty by introducing more flames into one tube. Another difficulty was to stop the sound sufficiently quick, as had been already mentioned, and he could not help thinking with Mr. Wills that this difficulty was not to be easily surmounted. Even when there was only one flame in a tube it was difficult to make the note speak quickly; and the longer the tube the greater was the length of time required for the note to sound. This showed that the hesitation was due to the length of time required for the vibrations to reach the top of the tube. The mechanical part of the instrument was very ingenious. He had employed valves; first, at the top of the tube, and worked by a small *digitarium*, but with this arrangement there was a perceptible interval between the striking of the key and the sounding of the note, and then at the bottom, in which position the note spoke more quickly. He thought, however, that in enlarging the instrument, and giving it greater power, M. Kastner had in some measure destroyed its sweetness and beauty of note. There also appeared to be a variation in the note, or gradation of sound, as the jets separated, and unless this could be cured, of which he was somewhat doubtful, he feared the instrument would never be more than a scientific toy.

The Secretary said M. Dunant wished him to draw attention to that part of the paper which stated that though singing flames had been well known for several years, M. Kastner claimed the merit of being the first to discover by means of the separation of the flames a method of instantaneously causing the note to sound.

Votes of thanks were given to MM. Kastner and Dunant, and to the ladies who had attended and played the instrument.

Chatham and Rochester Gas Company.—The half-yearly meeting was held on the 11th inst.—Mr. J. Whittle, the chairman of the company, presiding. The usual report and accounts were presented and approved; and the customary dividends were declared, at the rate of 10 per cent. per annum on the old shares, and of 7 per cent. per annum on the new shares. Alderman J. R. Foord and Mr. Brett, retiring directors, were re-elected, also Mr. King, the auditor who retired by rotation. The usual votes of thanks were passed.

IRON AND COAL TRADES OF SHEFFIELD, SOUTH YORKSHIRE, AND NORTH DERBYSHIRE.

(FROM OUR OWN CORRESPONDENT.)

The iron trade remains quiet, and in many respects very unsatisfactory It is pretty certain that the founders are, to a great extent, much more fully occupied than the manufacturers in any other branch of the iron trade, excepting the armour plate and charcoal iron departments of one or two of the principal Sheffield establishments.

I have recently alluded to the causes which lead to this conclusion, and can freely confirm what has been previously stated—viz., that the foundries are doing a tolerably good business in pipes, colliery castings, and builders iron-work. Pig iron has not been very materially altered in price, although there have recently been several transactions of respectable proportions in one or two leading numbers of foundry iron. Current quotations for Cleveland brands are these:—No 1 foundry, 63s.; No. 2 foundry, 61s.; No. 3 foundry, 58s.; No. 4 foundry, 57s.; No. 4 forge, grey, 56s.; No. 5 forge, mottled, 55s.; No. 6 forge, white, 53s.; refined metal, 76s.; Kentledge, 63s.; and cinder pig, 44s. per ton, net cash at the works.

The coal trade is anything but brisk, and, as an inevitable sequence, prices have begun to recede. On Monday last the Sheffield Coal Company, who do a large metropolitan and east coast trade, reduced their prices to the following:—Picked branch coal, 16s.; best Birley Silkstone, 14s. 6d.; screened Silkstone nuts, 8s. 6d.; screened seconds coal, 10s.; coke breeze, 11s.; hard melting coke (washed for steel-melting purposes), 18s.; and unscreened slack, 3s. per ton, of 21 cwt. at the pits. It has been explained, however, that these new prices do not apply to Sheffield itself. It would, nevertheless, appear to be very probable that a general reduction in the price of fuel will shortly have to be declared. Steam and gas coal are in fairly good request, at rates which vary from 10s. 6d. to 12s. 6d. per ton. The North-Eastern Railway Company are requiring a large supply of steam coal, and it is understood that the Great Northern Railway Company is at present taking about 1000 tons per diem from Earl Fitzwilliam's collieries for its own use.

The colliers at the Low Ground Colliery, Rotherham, and at Summerley Colliery, Unstone, went out on strike during the week, but in the former case the bulk of the men have since resumed their work on a compromise being effected.

IRON AND COAL TRADES OF SOUTH STAFFORDSHIRE AND EAST WORCESTERSHIRE.

(FROM OUR OWN CORRESPONDENT.)

There is no improvement in the condition of the iron trade of this district since our last report; and though as yet the mills and forges are, as a rule, running full time, it is evident that orders are now being rapidly worked off, and makers experience increased difficulty in replacing them. The transactions during the week have been few, and strictly limited to the more urgent specifications. The opinion that quotations will be easier shortly is fast gaining ground, and merchants purchase very cautiously. Although prices are nominally unchanged, unmarked iron is easier by 5s. per ton than the quotations ruling a fortnight ago. Unmarked bars of fair quality are easily procurable at £8 17s. 6d., and sheets at £11 15s. per ton. Tube strip is exceptionally weak, owing to the great depression prevailing in this department of local industry. Sheets, plates, hoops, and nail rods, chiefly for export, are the leading features of demand; and sheets for galvanized roofing purposes command a moderately active inquiry. Operations have just been commenced at the new and extensive works of the Darlaston Galvanizing Company, Limited, and 40 tons of corrugated roofing sheets were turned out during the first week of production.

The pig iron market now shares the general depression of the trade, but in this department the decline is more noticeable in the better than the inferior qualities. Cinder pig still realizes £3 5s. per ton, but all-mine hot-blast is 10s. lower, at £5. The heavy importations of pig from the Cleveland, Derbyshire, and other districts, are now seriously affecting this branch of the trade, and stocks are beginning to accumulate at many of the furnaces.

Foundry iron is in well-sustained request, many of the ironfounders report themselves busy; gas and water mains being in prominent inquiry. Gas-mains are now quoted £6 10s. for the smaller sizes, with a proportionate reduction for the larger diameters.

The demand for coal continues, and though supplies are plentiful there is no prospect of a reduction in prices so long as the South Wales strike remains unsettled. Important consignments of thick coal are now being despatched to Cardiff, and quotations are consequently maintained without difficulty. On the Wolverhampton side of the district, however, the commoner qualities of fuel are weaker; the supply of slack is greatly in excess of the demand, though sales are somewhat freer since the recent reduction, 2s. to 3s. per ton at the pit being the average prices now ruling.

THE COAL AND IRON TRADES OF LANCASHIRE.

(FROM OUR OWN CORRESPONDENT.)

There has been very little material change in the coal trade of this district since my last report, except, perhaps, that there has been a weakening tendency, although no real reduction in the price of the common descriptions of coal. For gas coal the demand is maintained, and prices are unchanged. House coal continues scarce, and the supplies of good hard furnace coal are scarcely sufficient to meet requirements; but of common engine coal and slack there is plenty in the market, and a little pushing for sales in some quarters. The men generally are working well, and as there is now no difficulty in obtaining colliers, there is a good output from most of the pits.

In the Liverpool market, although good prices are still obtained for steam and shipping coal, there is not, as I anticipated, any very material advance in the ruling rates; and as there are now tolerably plentiful supplies to replace the South Wales coal, there is no very great pressure on the part of buyers.

The coke trade continues quiet, and although local makers are about the same, Yorkshire and other cokes are offering in this district at low prices.

The committee appointed by the colliery proprietors with regard to the irregularity in the coal traffic of this district have collected a large amount of information. I have not yet heard what course they intend to pursue; but there is a rumour that attention may probably be called to the matter in the House of Commons. Meanwhile the railway companies have considerably improved in their deliveries of coal.

The Manchester and Salford Trades Council have declined to support the men in South Wales, or entertain the present lock-out as a trades question; and as this is a course which I understand will be taken by other trades councils throughout the country, it will be a bitter disappointment to the men, who have been led to believe that they would receive considerable assistance from these quarters.

The recently formed coal-company—Andrew Knowles and Sons, Limited—has proved a very successful undertaking, the profits on the past year being 37½ per cent., out of which a dividend of 12½ per cent. has been declared.

In the iron trade of this district there has been some little improvement during the past week, and prices are a trifle firmer. Middlesbrough pig iron delivered in the Manchester district is quoted 67s. 6d. for No. 3 foundry, 66s. for No. 4 foundry, and 64s. 9d. for No. 4 forge. Manufactured iron is without change in price, and bars are quoted at £8 17s. 6d. per ton.

Forge proprietors complain that the demand for their goods does not improve. Founders report a few more orders, but they are only placed at low rates.

THE COAL AND GENERAL TRADE OF THE NORTH OF ENGLAND.

(FROM OUR OWN CORRESPONDENT.)

There was less demand for gas coal at the shipping places on the Tyne last week. The Durham gas collieries appear to have got through the orders which crowded their books in the first month in the new year, and which was produced by various causes—the snow and ice blocking the local railway, storms at sea keeping ships back, and the inability of the North-Eastern Railway to furnish sufficient rolling-stock to bring the quantity of coal to the shipping places which was required. The trade seems now falling back upon its normal state. There is not much change in prices. The disputed point with regard to the proposed reduction of wages in the Durham gas collieries will have to come up for consideration shortly; but there is a general impression in trade circles that the masters and men will follow the example of the Northumberland coalowners, and try to have the matter settled by arbitration. Household coals are in moderate demand. The business is pretty steady, but there is no special activity. The continued lock-out in the South Wales district keeps the value of steam coal in Northumberland pretty firm at 16s. for best qualities, and 14s. for seconds. But the Scotch coalowners, who are offering steam coals of a moderately fair sort at 11s. per ton, are evidently underselling the Tyne, and a good few ships have gone to the Frith of Forth to load, in preference to coming here.

The coke trade has quite sustained its upward tendency. The prices of best qualities are higher, averaging 17s. 6d. to 18s. per ton delivered at the blast-furnaces.

The freight market is without much change. The rates to London are somewhat low, and a good few steamers are in the coal ports seeking employment in the coasting trade. Small vessels are more inquired after, principally to load gas coals for the English Channel ports. A little more money is offered for handy little ships.

The Cleveland iron trade was somewhat unsettled last week. There are some labour disputes on hand, and prices had a slight tendency upwards. The quoted price of pig iron was on the basis of 56s. to 59s. for No. 3. No. 4 forge was in strong request at 56s. In the finished iron trade, common bars have been selling at £8 2s. 6d; puddled bars, £5 to £5 5s.

In the chemical trade of the Tyne, the relations of the employers and the employed have become extremely unsatisfactory—the men belonging to the Newcastle Chemical Company, and those usually employed at Messrs. Hugh Lee Patteson's works, two of the largest concerns in the district, are locked out, and the prospect of a settlement is somewhat remote. There was a slight improvement in some of the quotations in the chemical trade last week. But, as a rule, this large business is very unproductive, and the manufacturers allege that they are still carrying on the concerns without a profit. The shipments of chemicals to the United States, which are usually very active at this season of the year, are limited, and there does not seem to be much prospect of an immediate revival in the American or continental demand.

A tolerably active demand has sprung up in the fire-clay trade. Several small ships were taken up last week to load fire-bricks for London.

TRADE NOTES FROM SCOTLAND.

(FROM OUR OWN CORRESPONDENT.)

The annual statistical returns which have recently been issued by the West of Scotland Association of Gas Managers, regarding the manufacture of gas in Scotland, have excited a considerable amount of attention among the gas companies, the members of corporation gas commissions, and gas consumers generally. Very pointed attention has been drawn by one newspaper to the high price and inferior quality of the gas supplied in Glasgow as compared with that supplied in other towns, such as Hamilton (where the price is only 4s. 2d. per 1000 cubic feet), and Paisley, Port Glasgow, Aberdeen, and other places (where the price does not exceed 5s. per 1000 cubic feet). Another important fact has also been referred to; it is that of the favourable position occupied by Glasgow five or six years ago as compared with the position of Aberdeen. The price in Glasgow was 4s. 2d., while the price of Aberdeen gas was 5s. 10d. per 1000 cubic feet. The tables are now turned, the price in Glasgow being 5s. 5d., as against 5s. in Aberdeen.

At the last meeting of the Stirling Town Council a letter was submitted from the gas company of the town, declining a proposal that had formerly been made by the council to purchase the company's works, guaranteeing the shareholders annuities at 9 per cent. In closing the discussion on the subject, the provost said that the public were deeply interested in the question, but they had asked that the business should not be run into precipitately. Information had been promised before anything further would be done. It was agreed, in the meantime, to delay consideration of the matter, and to transfer the management of the lighting from the Town Council to the Police Commissioners.

In the JOURNAL of the 26th ult. it was stated that Mr. Adam, of Kirriemuir, had been appointed manager of the Forfar Gas-Works, *vice* Mr. Innes. It appears, however, that there is no foundation for such a statement; indeed, at that date the corporation had not received the resignation of their manager. The Forfar Gas Commissioners held their ordinary monthly meeting last Monday, when it was announced that there were no fewer than forty applications for the managership, in succession to Mr. Innes. The committee were instructed to open the applications, reduce the list to five, and report to a special meeting to be held on Monday, the 22nd inst.

THE BIRMINGHAM GAS BILLS.—At the Walsall Town Council, on the 17th inst. it was unanimously resolved to unite with the Town Commissioners in opposing the bills for the transfer of the undertakings of the Birmingham Gaslight and Coke Company and the Birmingham and Staffordshire Gaslight Company to the Corporation of Birmingham, the object of such opposition being to procure the insertion of a clause making it compulsory upon the Corporation of Birmingham to sell to the Walsall authorities, upon terms to be settled by agreement, or by an arbitrator to be appointed by the Board of Trade, all the mains, pipes, and other property at present belonging to the Birmingham and Staffordshire Gas Company within the borough of Walsall. At a public meeting of the ratepayers at Aston Manor, held the same day, a resolution was adopted calling upon the local board to oppose the bills, and to apply the public funds for the payment of necessary expenses.

BLACKBURN WATER-WORKS.—PURCHASE OF THE UNDERTAKING BY THE CORPORATION.—At the half-yearly meeting of the shareholders of the Blackburn Water-Works Company on Monday, the 8th inst., a dividend of 8½ per cent. was declared. A bill to be submitted to Parliament, asking for additional powers to borrow and construct extended works, was unanimously approved by the meeting. The bill asks for power to borrow £200,000, and the cost of the new works will be £110,000. At a special meeting of the Blackburn Town Council on the 15th inst., it was resolved—"That the mayor be, and is hereby empowered to affix the corporate seal to a petition against the Blackburn Water-Works Company's bill, now in Parliament, and that the town-clerk summon the necessary meeting in accordance with the provisions of the Borough Funds Act, 1872, to enable this corporation to defray the expenses of opposing such bill out of the funds under their control, within the meaning of such Act, and that such opposition is hereby authorized." Fortunately the threatened hostility has been averted, and we now learn that the company have agreed to terms offered by the corporation for the purchase of their works. Those terms are the payment of 9 per cent. for the first five years, and at the expiration of that time the sum of 9½ per cent. in perpetuity. The value of the works is estimated at £200,000.

BARNSTAPLE GAS COMPANY.—The ordinary general meeting of shareholders was held on the 8th inst. Dr. Budd took the chair. The reports of the directors and auditors were read to the meeting, and upon the motion of Dr. Budd, seconded by Mr. Chanter, the same were received and carried unanimously. A dividend of 6 per cent. was declared upon the share capital of the company, payable out of profits made during the past year. Dr. Budd and Mr. W. Hunt were re-elected directors, and Mr. J. Turner auditor.—

GAS EXPLOSION AT NORTHALLERTON.— On Sunday night, Feb. 14, about eight o'clock, the inhabitants of Northallerton were alarmed by a loud report, caused by an explosion of gas in a class-room adjoining the Baptist Chapel. The gas was turned on about six o'clock, and the gas in the chapel lighted for service. A bracket in the class-room was not turned off, and gas escaped about two hours. When the Rev. W. Stubbings went to the class-room to turn the gas off at the meter, the gas rushed into the chapel, where a light was burning, and caused the explosion, knocking the class-room walls down and blowing the roof off; also smashing all the windows in the chapel. The pastor narrowly escaped being killed, and was very much burned and cut about the head.

FATAL ACCIDENT AT THE IMPERIAL GAS-WORKS.—An inquest was held at St. George's Hospital, or Wednesday last, on the body of George Chalk, aged 32, a pipe-jumper at the Fulham works of the Imperial Company, who died from injuries received on the 23rd ult. The foreman of the works, Charles Sears, said deceased had been employed by the company for some years, and was generally a sober man. On the evening of the accident deceased told him he had a tar-box to clean out, and proceeded to do it. Shortly afterwards witness found him lying on the stage, which was about 13 feet away from it. Assistance was obtained, and deceased was sent to the hospital. He stated that he was in the act of hanging a shoot on for the purpose of cleaning the box out, when he slipped and fell. The medical evidence showed that when brought to the hospital deceased was suffering from a compound fracture of the thigh bone extending to the knee. He continued to progress favourably until the 7th inst., when symptoms of blood poisoning set in, and he expired in the evening of that day. The jury returned a verdict of "Accidental death."

NEWPORT (MON.) GAS COMPANY.—At the half-yearly meeting of this company, on the 15th inst. Mr. T. Gratrix in the chair—the following report of the directors was presented and adopted:—"The statement of accounts, as audited, for the half year ending Dec. 31 last, shows that the balance of net earnings is considerably less, occasioned mainly by the additional cost of coal. Yet it is sufficient to admit of a payment of the same dividend as in the corresponding period of last year. The scrubber, purifier, condensers, ammoniacal tank, and additional railway siding, referred to in our last report, are now completed, and work most satisfactorily. A contract to replace the old purifiers by three larger ones, adapted to meet the increasing make of gas, had been entered into. A contract has been entered into with Messrs. Law and Son, of Wolverhampton, for the excavation and building of a gasholder-tank 100 feet in diameter, and the works are progressing satisfactorily. Steps are also being taken to contract for the erection of a telescope gasholder adapted to the above tank. These works will entail a considerable outlay, absorbing the whole of the share capital of the company and borrowing powers. The directors have caused a bill to be deposited this session, with a view to raise additional capital, and to erect works beyond the limits of the borough, and to meet the increasing requirements of the district. The bill has passed Standing Orders, and at a more advanced stage will be submitted for the approval of the shareholders at a Wharncliffe meeting. On the motion of the chairman, it was resolved—'That dividends at the rate of 5 per cent. on class A shares, and of 3½ per cent. on class B shares, for the half year ending Dec. 31, 1874, be declared, and that the same be payable on the 22nd inst.'"

MORECAMBE GAS COMPANY.—The annual meeting of shareholders was held on the 1st inst.—Mr. J. Tetley in the chair. The report and accounts submitted showed that, including a balance of £179 19s. 8½d. brought from last account, the gross income amounted to £2118 18s. 1d., and the expenditure to £1367 5s. 6d., leaving a balance of £745 12s. 7d. to credit. The directors recommended a dividend of 10s. per share to be declared (free of income-tax) upon the paid-up capital of £5 per share, and 6s. 9d. per share upon the 800 new shares created in 1870, on which £3 10s. had been paid. This would absorb £670, leaving a balance of £75 12s. 7d. to be carried to next account. There had been charged to capital account, during the past year, the sum of £629 8s. 5d. In accordance with a resolution passed on the 9th of December last, the directors purchased a further plot of land adjoining the gas-works, and in order to meet the payment thereof, a call would be made of £1 per share on the 800 new shares, payable on the 17th day of April next. The directors have much pleasure in recommending a reduction in the price of gas to the extent of 5d. per 1000 cubic feet, such reduction in price taking effect from the 1st of January last. The chairman, in moving the adoption of the report, said he believed he could safely say that the company's works were in a very efficient state, and he was not aware that they should want anything out of the ordinary course during the ensuing year except the renewal of the tops of the purifiers, which would cost from £60 to £80. Great credit was due to the management, and he hoped they would continue to be able to show a satisfactory balance-sheet. The report was adopted, the dividends declared, and the retiring directors and auditor re-elected. Thanks were voted to the chairman, and to the manager (Mr. Duff), and secretary (Mr. Stephenson). A special meeting was subsequently held to alter one of the articles of association in reference to the meetings of the company.

ROCHESTER AND CHATHAM WATER-WORKS COMPANY.—The half-yearly meeting was held on the 16th inst.—Mr. J. Baird in the chair. The report of the directors referred to the continued progress of the company, the receipts for the year 1874 being £500 16s. 3d. in excess of the previous year. The work of deepening the well and making new adits at a low level at the company's works at Luton, for the purpose of obtaining an increased supply of water, has been carried on during the past six months with as much speed as possible, but in consequence of the difficulties that have had to be contended with, the work has been much interrupted and its progress delayed. During the carrying out of this important work, which it is anticipated will be attended with most beneficial results, it has been found impossible to continue the constant service supply, and the directors consider that rather unfair advantage has been taken of this circumstance to make it an occasion of a complaint against the company. The directors recommend that a dividend at the rate of £6 per cent. per annum (free from income-tax) be declared upon all shares for the half year ended the 31st of December, 1874, such dividend to be payable on and after the 20th of March next. The directors also recommend that the sum of £100 be taken from the balance profits, and added to the reserve-fund, and that the balance of £535 2s. 3d. be carried forward to the next account. The capital account showed that £41,700 had been received, the whole of which had been expended. The amount received on account of water supplied during the past half year was £4587, leaving, after deducting £1168 for repairs, renewals, &c., wages and salaries, coals, law expenses, &c., and placing a further sum of £100 to the reserve fund, a balance profit of £1048 available for a dividend at 6 per cent. per annum. The reserve-fund now amounts to £3500. The report was adopted, the retiring directors and auditor re-elected, and the usual votes of thanks passed.

WAKEFIELD WATER-WORKS COMPANY.—The half-yearly meeting was held on the 12th inst.—Mr. Statter in the chair. The directors in their report congratulated the shareholders that they were again in a position to recommend the payment of the usual dividend, at the rate of 9 per cent. per annum, upon the paid-up shares of the company, and also the authorized dividend at the rate of 5 per cent. per annum upon the £10 shares, all clear of income-tax, and to carry a surplus of £226 17s. 2d. to the reserve-fund, which fund now amounts to £2033 10s. 6d. The chairman, in moving the adoption of the report, stated that the income of the company was about £10,000. The balance of profit for the half year was £3718 7s. 2d., the capital account was £93,874 15. 8d., and the balance of unprovided capital was £6304 15s. 8d., which, as they would see, would necessitate the making of another call in a very short time. Their parliamentary expenses were £9093 10s. 11d., in addition to what had been expended before. The report having been adopted, the meeting was made special to consider the new bill of the company. The question was discussed for nearly three hours. Mr. Watson moved the following resolution:—"That after the explanation given by the chairman as to the difficulties of obtaining the present bill now before Parliament, this meeting is of opinion that the bill should not be proceeded with." Mr. Watson was strongly urged to withdraw his resolution, but he declined because he firmly believed the proposed scheme was worthless, and he hoped Parliament would throw it out. Mr. J. Marsland seconded the resolution. Alderman Howden moved an amendment, authorizing and empowering the directors to proceed with the bill in Parliament, and this was seconded by Mr. G. Dryden. On the matter being put to the vote there were 55 for the amendment, and 7 against it, representing 1365 voters for the amendment, and 150 against, or a majority of 1215 votes for the amendment.

CROYDON COMMERCIAL GAS AND COKE COMPANY.—The half-yearly meeting of proprietors was held at the town-hall, Croydon, on Wednesday last, Mr. E. Berney in the chair. The report of the directors showed that after adding a considerable amount to the reserve-fund, the net profit of the half year to Christmas, 1874, was still somewhat in excess of the sum required to meet the statutory dividend. Coals had been purchased on more favourable terms than in the earlier months of the year, but, nevertheless, the saving in the coal account was more than counterbalanced by the decreased revenue derived from the sale of coke, owing to the low prices which this and all other gas companies had been compelled to accept for this product. The prosperity of the company, therefore, depended more especially on the steadily increasing consumption of gas, which at present was at the rate of upwards of 15 per cent. This increased demand for gas in the town and district could only be met by an extension of the plant, and inasmuch as the whole range of retort benches had been in operation this winter, the directors found it necessary to erect a new retort-house and additional purifiers. With this object, in connexion with other extensions and improvements, the directors were seeking the advice of a eminent gas engineer, and they expected that works of considerable magnitude would be carried out during the present year. For some time after the decease of their late respected colleague, Mr. Chasemore, the directors thought it not advisable to fill up the vacancy at the board, but finding that the shareholders themselves could not legally elect a director to fill up this vacancy until February, 1877, and learning from the remarks made at the last half-yearly meeting that the shareholders would prefer the full number of directors to be kept up, while the gentleman they would wish to be selected was very plainly indicated, the directors had, on further consideration, invited Mr. Henry Chasemore to join them, and they had much pleasure in stating that he had accepted the vacant seat at the board, which was now at its maximum number. The directors recommended to the shareholders to sanction an addition to the salary of the secretary, Mr. W. J. Russell, on and from the 1st of January last. The accounts showed that the net profit for the half year, after appropriating £420 to the reserve-fund, was £5191 2s. 4d. The rental for the half year was £17,911 14s. 5d. The report was received and adopted, the retiring directors and auditors re-elected, and the dividend approved and ordered to be paid at the company's bankers on and after the 18th inst. The increase in the salary of the secretary, as recommended, was agreed to.

SCARBOROUGH WATER COMPANY.—The annual general meeting of shareholders was held on the 15th inst.—the chairman (Mr. J. Woodall) presiding. The report of the directors stated that during the past exceptionally dry season the yield of water from the springs at Cayton diminished considerably, but was always, even at its lowest, much more than sufficient for the wants of the town. The supply had now increased to its former ample proportions. The statement of accounts showed the increase of capital account to be £692 3s. 10d., of which £439 14s. was for the improvement of the well at Cayton, resulting in a considerable increase of water. In the revenue account, it was pointed out, the cost of coal was £191 1s. 8d. less than last year, while there was also a decrease of £406 3s. 8d. in labour, though the item for repairs of boilers, &c., showed an increase of £130 17s. On the credit side the water-rates received had amounted to £8378 1s 8d., being an increase of £1224 2s. 7d. on last year. After meeting all charges, there remained a balance of £5084 9s. 8d., which enabled the directors to recommend a dividend (free from income-tax) at the rate of 7½ per cent. on old shares, and 7½ per cent. on the new shares, paid up, after which a balance of £870 19s. 8d. would remain in hand. The chairman, in moving the adoption of the report, explained and justified the action taken by the company in making the regulation that waste-pipes should be visible. The company had only power to enter premises when they suspected that a waste was going on, at certain special times, and under the old system, the waste-pipes being conducted into the drains, the company were powerless, especially at night, to check a waste of water, and there had been a considerable difference between the quantity pumped up at the company's works and the quantity paid for. In view of the risks attending the work of supplying water to a town, the public, as well as the shareholders, would agree that there ought not to be an indiscriminate waste of water. The adoption of the report was seconded by Mr. E. H. Hebden, and carried. Resolutions were then passed fixing the rate of payment for consumers for domestic purposes at the rate of 5 per cent. upon the amount at which the premises supplied are valued to the poor-rate; houses of under £5 value to be at the rate of 5s. each; while the rate for water supplied by a meter for other than domestic purposes was to remain as at present. The retiring directors were re-elected, and Mr. H. Herbert was elected auditor in the place of Mr. S. W. Theakston, deceased. A proposition by Dr. Cross for paying the directors was deferred, and the proceedings closed with a vote of thanks to the directors.

MEETINGS IN BRIEF—*Gas Companies:* The half-yearly meeting of the Airedale Company was held on the 8th inst., when a dividend at the rate of 10 per cent. was declared. At the meeting of the Dungarvan Company on the same day a dividend of 8 per cent., free of income-tax, was declared, and a vote of thanks was unanimously passed to Mr. James Lennon, the efficient engineer and manager of the works, and to Mr. Michael Leahy, the secretary, for their careful attention to their duties. On the 10th inst., a meeting of the Crowle Company was held, at which a dividend of 10 per cent. was paid, and a considerable surplus of profits was carried over. The Andover Company held their meeting on the 16th inst., and a dividend of 7 per cent. was declared. At the Blakeney (Forest of Dean) Company's meeting on the 18th inst., the report of the directors was by no means favourable, owing to the heavy cost of fuel which had continued throughout the whole year. The dividend declared was at the rate of 3 per cent. At the Witney Company's meeting on the 15th inst., a half-yearly dividend at the rate of 5 per cent. per annum on the ordinary, and 6 per cent. per annum on the preference shares, was declared payable at Lady-day next. The annual report of the Wotton-under-Edge Company has been issued, and a dividend of 5 per cent. declared. The total receipts for the year amounted to £853 19s. 8d., and the net profits were £160 4s., as compared with £189 3s. 8d. in 1873. The reserve-fund is £248 12s. 7d.—*Water Companies:* The twelfth annual meeting of the Faversham Company was held on the 1st inst., the report showed that 692 houses are now supplied with water, 33 having been added during the past year. The directors recommended the declaration of a dividend of 5 per cent., to be

paid without reduction for income-tax; and that £25 of the present balance in hand be invested as a reserve-fund, which was agreed to. A dividend of 5 per cent. was declared at the annual meeting of the Liskeard Water-Works Company on the 12th inst. At the meeting of the Whitby Company on the 16th inst., a dividend of 9½ per cent. for the year was declared. The half-yearly meeting of the Cleveland Company has just been held. The capital expenditure of the company to the end of 1874 amounted to £50,279 8s. 7d. The receipts on revenue accounts for the last half year were £3007 17s. 10d., of which £229 7s. 10d. was absorbed for working expenses, leaving a balance of £2778 10s., which, after providing for interest on prepaid calls, &c., left a disposable balance of £2375 1s. 2d. It was resolved that a dividend of £10 per cent. per annum be paid on the original and A shares, together with a bonus of 3s. per share on the original issue; that £350 be added to the reserve-fund, making that fund £2000, and £328 4s. carried forward to the next account. The Ruthin Company held their meeting on the 13th inst., at which it was reported by the directors that the committee of investigation, which was appointed for the purpose of examining the contract between the company and the contractor, for the construction of the reservoir, &c., and also to investigate the affairs of the company generally, had sent in their report, which is now under the consideration of the directors. The revenue was steadily increasing, the gross receipts for the past half year were £213 15s., leaving a balance of £54 9s. 7d., which the directors proposed to carry to the credit of the current half year's revenue account. The works at Plas-y-nant, and the mains in the town, were in efficient order.

Tunbridge Wells Gas Company.—On Monday evening, the 15th inst., a numerously attended meeting of gas consumers was held at the Royal Sussex Assembly Rooms to hear statements from the gas company as to the objects of the directors in again promoting a bill in Parliament. The chair was occupied by Mr. Hunter, who referred at some length to the past history of the company, and replied to some of the misstatements recently made in the town at meetings got up for the purpose of fostering agitation against the company. Mr. Simpson then explained the provisions of the bill, and a general conversation ensued, which was interrupted by a person in the room who was neither a ratepayer nor a consumer. No resolution was, according to a previous understanding, proposed, and the chairman, in closing the proceedings, said the company were now willing to concede many points, and he had no doubt the proper way would be to meet in a friendly manner, with a spirit of concession mutually displayed. This would be to the advantage of the ratepayers, by saving expensive proceedings, and a most desirable consummation for the company. He concluded by thanking the meeting for their kind attention. Another meeting took place in the town-hall on Tuesday evening, the Hon. F. G. Molyneux presiding. The chairman, in opening the proceedings, said the gas company were about to introduce a new bill into Parliament, and the question was "Are there any, and what clauses in the bill that militate against the interests of the ratepayers of the town of Tunbridge Wells?" The resolution he proposed was as follows:—"That in order to enable the local board of this town to oppose the bill introduced into Parliament in the present session by the Tunbridge Wells Gas Company, and to charge the cost of such opposition on the rates under their control, the owners and ratepayers of the district of Tunbridge Wells, in public meeting assembled, do hereby resolve that their consent be given to such opposition." Mr. Browell thought the great objection to the bill was the enormous power which it would, if it passed into law, place in the hands of the gas company for the next 50 years perhaps; it would enable them to indulge in an enterprise of a highly speculative character in other districts than Tunbridge Wells. Mr. Roper expressed an opinion unfavourable to the resolution, and moved as an amendment—"That the local board be requested to do all in its power to procure the insertion of a clause in the Tunbridge Wells Gas Company's bill, now before Parliament, to authorize the purchase of the works on behalf of the ratepayers of the town, and to secure the services of the existing staff of the company." The chairman put the motion to the meeting, and announced that it was carried by a large majority. A poll was demanded, but the demand was withdrawn upon the following resolution being adopted:—"Without prejudice to any further proceedings on the part of the ratepayers, the local board, or gas company, in the event of any arrangement not being come to, this meeting is willing that all opposition should be withdrawn to the gas company's bill in the present session of Parliament, upon the understanding that the gas company will accept an alteration therein, proposed by the local board, more especially as to the offering 5s. as the maximum price to be charged per 1000 cubic feet for 14-candle gas within the Local Act District of Tunbridge Wells."

Lighting Collieries by Gas.—Considerable work is being done in connexion with the lighting of collieries by Messrs. Huntriss's patent steam gas-jet, which promises to come into very general use. Messrs. Hutchinson Brothers, of Barnsley, are just now engaged in fixing the apparatus with a view of lighting up the bottom of the shafts of the Annesley Colliery, near Nottingham, and and the Connock Colliery at Rugeley, South Staffordshire. The shafts of the former colliery are 500 yards deep, and those of the latter about 380.

Pipe-Works in the United States.—The Tasker Iron-Works, at Newcastle, Delaware, have recently added four new buildings, which largely increase their facilities. These consist of bending and welding mills, each 144 by 283 feet; finishing mill, 150 by 300 feet; and a gas-producing house, 40 by 128 feet; also a large boiler-house and two engine-houses, in which are engines of 250 and 150 horse-power. The machinery is calculated to produce, at present, about six miles of tubing or pipes per day. The company have already expended over 600,000 dols. in these improvements.

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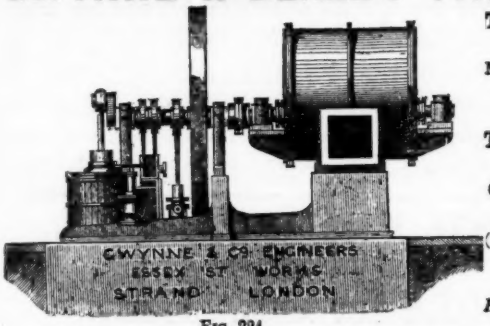

Fig. 224.

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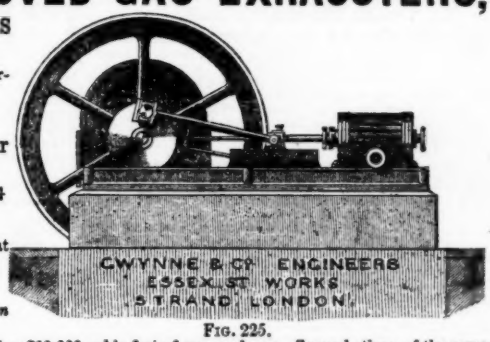

Fig. 225.

Fig. 224 represents one of those erected at the Imperial Gas-Works, Bromley, capable of passing 210,000 cubic feet of gas per hour. Several others of the same size are now on order for the same Company. These Patent Machines combine the highest quality of workmanship and materials, the largest bearings and wearing surfaces, with the **most perfect system of action yet discovered.** Fig. 225 represents one of a series of four at the Nottingham Gas-Works, each passing 62,500 cubic feet per hour. Gwynne and Co. *do not pretend to enter into a struggle with other makers in respect to cheapness. They have never sought to make price the chief consideration, but to produce Machinery of the very highest quality, and the most approved design and arrangement.* Their prices have been estimated with a due regard to the **excellence of the article produced,** and when this is taken into consideration, they have no fear for the result. The orders executed this season for Exhausters and alterations to their patented system amount to over 4,000,000 cubic feet of gas passed per hour, and to over 300 horse power for Engines to drive them. In every instance their work is giving the greatest satisfaction. Numerous testimonials and references can be given.

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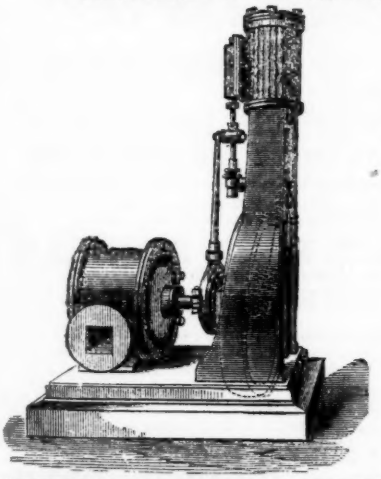

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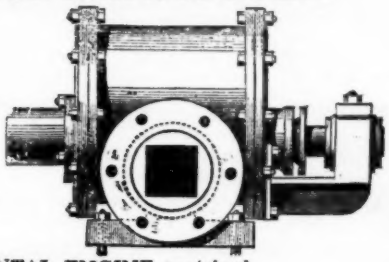

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WANTED, at a Gas-Work, a competent Man as GAS-FITTER and Main and Service Layer. One who can do ordinary smith's work preferred.

Address No. 121, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, three good second-hand PURIFIERS, 5 ft. square each, with connexions to suit.

Apply, stating terms, &c., to JOHN SMITH, Gas-Works, HELMSLEY.

WANTED, a Service-Layer and Meter- Fixer. Part of his duty would be to superintend the public lamps and assist at the quarterly inspection of meters.

Applications, with references, age, experience, and wages required, to be addressed to No. 136, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED immediately, by the Victoria (Newmarket) Gaslight and Coke Company, Limited, a competent and experienced GAS MANAGER, with some knowledge of accounts, to take charge of the above works. Salary £110. Good house, and gas found.

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Full particulars, prepaid, to Messrs. WILLIAM BLEWS AND SONS, BIRMINGHAM.

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WANTED, a Manager for the Gas- Works at Newcastle, Staffordshire. The Directors are desirous of obtaining the services of a Manager, who thoroughly understands the manufacture of gas, and the conduct of all branches of the business, inclusive of the keeping of the books of the concern.

The Manager will have the occupation of an excellent house, fuel and gas free, and a salary of £160 per annum to commence with.

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One Plain Boiler, 8 ft. by 3 ft., without flue.

One 16-h.p. Horizontal Engine, 12-in. cylinder, 30-in. stroke, complete, with fly-wheel 8 ft. 6 in. diameter.

One set of 10-in. Pumps, with working barrel, bucket, and clack, and 30 ft. to 40 ft. flanged suction-pipe.

One 8-in. Pump, with flanged suction-pipe.

One "Jones's" Exhauster (100,000 per hour), with flanged casting for connexions, and four 2-ft. slide-valves.

Also four 18-in. Slide-Valves.
Six 12-in. "
Two 14-in. "
One 10-in. "
Two 24-in. Walker's Valves.

One Double 4-in. Steam-Valve.

May be seen, and further information obtained, on application to the MANAGER, at the Gas-Works, Saltley, BIRMINGHAM.

HERNE BAY GAS AND COKE COMPANY.

GAS-WORKS FOR SALE.

NOTICE is hereby given that the Direc- tors are prepared to receive PROPOSALS for the purchase of the FREEHOLD and WORKS at Herne Bay, Kent, or for a lease of the works from March next.

Particulars as to the property, and orders to view the works, can be obtained at the Office of the Company, 66, Chancery Lane, London, W.C.

H. E. NEWTON, Secretary.

BETTWS-Y-COED GAS AND COKE COMPANY, LIMITED.

THE above Company require, in about one month from this date, an efficient person as GAS-FITTER, Main and Service Layer, and to take charge of the Gas-Works, as Working Manager, when complete. House, coal, and gas.

Address, stating age, wages required, and references, &c., to J. T. HALL, Engineer, PRESCOT.

Feb. 20, 1875.

TO PIPE-FOUNDERS.

THE Directors of the Gloucester Gas Company invite TENDERS for about 3500 yards of 13-inch and 150 yards of 24-inch Spigot and Socket Cast-Iron PIPES.

Specification, and other particulars, may be obtained on application to the undersigned.

Offers, endorsed "Tender for Pipes," and addressed to me, to be delivered not later than the 15th day of March next.

The Directors do not bind themselves to accept the lowest or any tender.

R. MORLAND, Engineer.

Gas-Works, Gloucester, Feb. 19, 1875.

TO GAS-WORKS MANAGERS.

THE Savile Street Foundry and Engi- neering Company, Limited, Savile Street East, Sheffield, supply, at exceedingly low rates, Retort Mouthpieces, Ascension-Pipes, Hydraulic Mains, Condensers, Scrubbers, Purifiers, Holder-Tanks, Columns, Exhausters, and Engines for driving Exhausters.

Specifications promptly attended to.

THE Lymm Local Board invite Tenders for the EXTENSION of their Gas-Works.

The plans can be seen, and quantities obtained, at their Offices in Lymm daily, from February 19 to March 2, 1875, between the hours of Eleven and One.

The tenders to be sent in on the 4th of March, to the Chairman of the Local Board, West View, Lymm.

The Board do not bind themselves to accept the lowest or any tender.

(Signed) THOS. J. RIDGWAY,
Clerk to the Lymm Local Board.

THE Gas Committee of the Stockton Corporation are prepared to receive TENDERS for the excavation and construction of a GASHOLDER-TANK, 122 ft. diameter and 26 ft. 6 in. deep.

The plans and specification may be seen, and further particulars obtained, at the Office of the Gas Engineer to the Corporation, Gas-Works, Stockton-on-Tees.

Tenders, sealed and endorsed "Gasholder-Tank," to be sent in to H. G. FABER, Esq., Town-Clerk, STOCKTON-ON-TEES, not later than the 1st of March, 1875.

The Gas Committee do not bind themselves to accept the lowest or any tender.

TO GASHOLDER MAKERS.

THE Directors of the Town and County of Poole Gas and Coke Company are prepared to receive TENDERS for the erection on their works of a Cast-Iron TANK, 71 ft. by 18 ft.; also a GASHOLDER, 70 ft. by 18 ft., with columns, girders, and other appendages; also a Tank and Gasholder, 80 ft. by 18 ft.

The foundation for Tank will be laid by the Company.

Tenders, including plan and specification, to be sent to the Company's Office, on or before the 8th of March next.

The Directors do not bind themselves to accept the lowest or any tender.

JOHN BUDDEN, Secretary.

Poole Gas-Works, Feb. 15, 1875.

MERTHYR TYDFIL GAS-WORKS.

RETORT MOUTHPIECES, ASCENSION, ARCH, AND DIP PIPES, HYDRAULIC MAIN, &c., &c.

TO BE DISPOSED OF, at a low price, a number of 15-in. diameter, with 5-in. outlet-sockets, Round Retort Mouthpieces, complete, with wrought-iron lids, cross-bars, and screws, &c., and 5-in. by 4-in Ascension, Arch, and Dip-Pipes. Also several lengths of 16-in. by 14-in. U-shape Hydraulic Main. All the castings, &c., were obtained from Messrs. Newton, Chambers, and Co., Thorncliffe Iron-Works, and are in good and clean condition.

For price and further particulars apply to the undersigned.

JOHN LEES COCKER, Manager and Secretary.

Gas Offices, Merthyr Tydfil, Feb. 15, 1875.

MESSRS. JOHN BETHELL & CO.,

(ESTABLISHED 1836,)

CONTRACTORS for GAS TAR,

MAKERS OF ANTHRACENE, CREOSOTE, &c.,

CLAYTON CHEMICAL WORKS, MANCHESTER;

SWAN VILLAGE, WEST BROMWICH.

Head Offices: 38, KING WILLIAM STREET, LONDON BRIDGE.

ALFRED WILLIAMS,

PHŒNIX FIRE-BRICK WHARF,

64, BANKSIDE, SOUTHWARK, LONDON, S.E.

GAS ENGINEER AND CONTRACTOR FOR THE ERECTION OF GAS-WORKS,

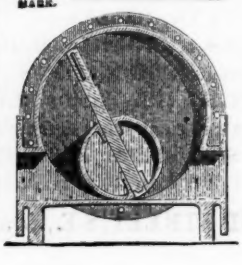
AND FOR THE

SUPPLY OF RETORTS, FIRE-BRICKS, CAST-IRON MAINS,

AND ALL MATERIALS FOR GAS MANUFACTURE AND DISTRIBUTION.

TRADE MARK.

J. BEALE'S
PATENT
GAS EXHAUSTER.



BEALE'S CONTINUOUSLY ACTING

GAS EXHAUSTERS

ARE NOW MANUFACTURED BY

B. DONKIN & CO.

MR. J. BEALE, of East Greenwich, having retired from business, has made an arrangement with B. DONKIN & CO. for the sole manufacture of his Patent Solid-Slide Gas Exhausters.

B. D. & Co. also make Steam-Engines to drive Gas Exhausters direct or otherwise, and Gas-Valves.

Estimates and Prices on application to

B. DONKIN & CO.,
ENGINEERS & IRONFOUNDERS,
BERMONDSEY, LONDON, S.E.

SULPHATE OF AMMONIA AND TAR DISTILLING APPARATUS FOR SALE.

THE whole of the requisite apparatus for working up the Tar and Liquor from Gas-Works carbonizing about 6000 or 7000 tons of coal per annum, to be SOLD, a bargain.

The apparatus consists of Tar and Liquor Stills, each capable of working 1000 gallons each charge. Saturator, Washing and Draining Tables lined with lead. Small Steam Boiler and 2-h.p. Engine, nearly new. Acid and Lime Washing Vessels, Coil Box, and small Still, with all necessary pipes and connexions.

Further particulars, with price, may be obtained, on application, by letter, to No. 130, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

THE Local Board for the district of Atherton, Lancashire, are prepared to receive TENDERS for the supply, fixing, and completing of Four Dry Lime PURIFIERS, each 12 ft. square by 4 ft. 6 in. deep, with 12-in. connexion-pipes, dry centre-valve, and lifting apparatus.

Also Two Wrought-Iron SCRUBBERS, 18 ft. high by 5 ft. diameter, with 12-in. inlet and outlet connexion-pipes complete.

Drawings and specifications may be seen at the Gas-Works, Atherton, on application to the undersigned.

Sealed tenders for the above, together or separately, and endorsed "Tender for Purifiers, &c.," may be delivered to me not later than Friday, the 26th day of February instant.

No allowance for tenders, nor do the Board bind themselves to accept the lowest or any tender.

By order,
DANIEL SCHOFIELD, Clerk.

Atherton, near Manchester, Feb. 6, 1875.

THOMAS ALLAN & SONS, of Springbank Iron-Works, Glasgow, manufacture small cast-iron GAS AND WATER PIPES, 1½ to 6 inches, at their branch works, Stockton-on-Tees, and have at present a large stock, which they are open to sell at moderate prices.

GARSIDE'S IMPROVED REGISTERED TUBE-VICE, holds all sizes of Wrought-Iron and Brass Tubes, from a 2-in. socket to the smallest brass tube made.

GARSIDES IMPROVED MAIN DRILLING CLIP, made in two sizes, to drill from 2-in. to 6-in. Mains, and from 6-in. to 12-in. Mains.

The above tools are made light and handy.

For drawings, &c., apply to the maker, SAMUEL GARSIDE, Gatefield Iron-Works, ASHTON-UNDER-LYNE.

YSTRAD GAS AND WATER COMPANY.

No. 2 GAS STATION.
CONTRACT FOR THE ERECTION OF WORKS, &c.

THE above Company solicit Tenders for work to be done in the erection of GAS-WORKS, near Porth, Rhondda Valley, Glamorganshire.

Contract No. 1 comprises the excavation, brickwork, &c., of a Gasholder-Tank, 62 ft. in diameter, with Gasholder to work therein; the erection of Boundary Walls, and of all buildings; and the supply and fixing of all the Apparatus, with 6 and 8 in. Connexions, requisite in the construction of such Gas-Works.

Contract No. 3.—Laying about 11,000 yards of Street Mains.

Full particulars may be obtained, and inspection of the plans and specifications, after the 20th inst., on application to the Company's Engineer, Mr. John Lees Cocker, Gas-Works, Merthyr Tydfil.

Sealed tenders to be forwarded to the undersigned, endorsed with the No. of the Contract, not later than Monday, the 8th day of March next.

The Directors do not bind themselves to accept the lowest or any tender.

By order,
FRANK JAMES, Secretary.

134, High Street, Merthyr Tydfil, Feb. 15, 1875.

BRONNER'S PATENT GAS-BURNERS give 99 per cent. of light, as compared with 27 per cent. given by ordinary burners, with equal consumption of gas.—*Vide* "Gas Referees Report," published June, 1869.

HENRY GREENE AND SON, Sole Consignees of Brönner's Patent Improvements in Gas Lighting, 16 and 17, King William Street, LONDON, E.C.

C. & W. WALKER,

MIDLAND IRON-WORKS,
DONNINGTON, NEAR NEWPORT, SHROPSHIRE,
MANUFACTURERS OF

TELESCOPIC AND SINGLE-LIFT

GASHOLDERS,

CAST & WROUGHT IRON GASHOLDER-TANKS,

CONDENSERS, SCRUBBERS, & PURIFIERS.

LONDON: 8, FINSBURY CIRCUS, E.C.

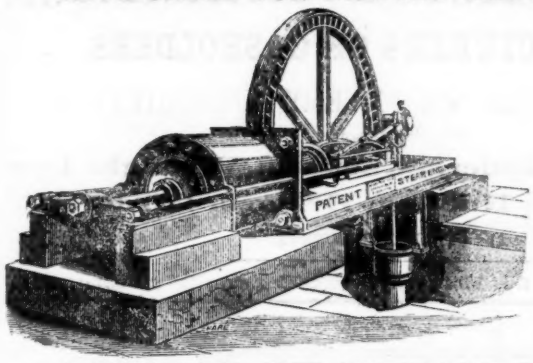
ECONOMY OF FUEL IN STEAM-ENGINES.

B. DONKIN & CO.,

PATENT HORIZONTAL COMPOUND CONDENSIN G

STEAM-ENGINES,

APPLICABLE FOR DRIVING GAS-EXHAUSTERS.



These Engines have been at work a sufficient number of years to prove their durability and efficiency.

One of them has been subjected to a scientific and exhaustive trial to test the consumption of fuel, with the result that an expenditure of less than **2 lbs.** of coal per hour developed one indicated horse power.

Full Details of this Trial, and Prices, sent on application to

B. DONKIN & CO., BLUE ANCHOR ROAD, BERMONDSEY, S.E.

LIME SUPERSEDED
IN THE
PURIFICATION OF ILLUMINATING GAS
BY
SPENCE'S PATENT DRY COPPERAS.

The only purifying material which removes by one process, without injury to the purifiers, all Ammonia and Sulphuretted Hydrogen. It has been in use for upwards of five years at some of the largest Gas-Works in the Kingdom.

TESTIMONIALS SENT ON APPLICATION TO

SPENCE BROTHERS CHEMICAL COMPANY, LIMITED,
VICTORIA CHEMICAL WORKS, BRADFORD, MANCHESTER;

SOLE MANUFACTURERS OF SPENCE'S PATENT DRY COPPERAS,
SPENCE'S PATENT GAS DEODORIZER, AND MUDIE'S DISINFECTANT;
MANUFACTURERS OF
SULPHATE OF AMMONIA, VITRIOL, COPPERAS, &c.;
PURCHASERS OF SPENT OXIDE AND AMMONIACAL LIQUOR, AND CONTRACTORS FOR THE PURIFICATION OF COAL GAS.

COST PRICE SHEETS.

MANUFACTURE AND DISTRIBUTION OF GAS. These sheets are the same as were laid before the Dublin Meeting of the British Association of Gas Managers; but in the REPRINT, NOTES have been added for the guidance of those using them. Copies of the two sheets may now be had, price 5s.

South Shields. W. J. WARNER.

BAILEY'S Patented Inventions are now in extensive use wherever steam is known. Bailey's Patent Steam Gauges, Pyrometers, Water Gauge Cocks, Test Pumps, Fusible Plugs, Steam and Water Valves, Safety Valves, Junction Valves, Pumps, Tell-Tales, Recorders, Lightning Conductors, Electric Telegraphs, Turret Clocks, Steam Joint Cement, Lifting Jacks, Boiler Feeders, Lime Catcher and Separator, Injectors and Ejectors, and every description of first-class Brass Work for Engines and Boilers. Gas-Works Managers who have not our large book should send for it.

16th edition, 1000 engravings, 4to., post free 2s. in stamps, weight 10 oz., cost of production £1000,

BAILEY'S Illustrated Inventions, containing details and prices of goods in our five several departments:—(1) Brass Foundry, Steam Gauges, Indicators, Feeders, and Fittings; (2) Engineers Sundries, Small Tools, and Stores; (3) Machine Pump and Fire Engine: (4) Turret Clock, &c.; (5) Electric Telegraph, A B C Instruments, Bells, and Apparatus.

J. BAILEY and Co., Albion Works, Salford, LANCASHIRE.

Mr. NORWOOD EARLE,

GAS SURVEYOR,
12, QUEEN VICTORIA STREET, E.C.,

Advises on all matters connected with the Distribution of Gas, Public Lighting, Gas Testing, &c.

Valuations made for Assessment and other Purposes.

Mr. ALFRED LASS,

60, CORNHILL, LONDON, E.C.,

Is prepared to open the Books, and, if necessary, keep the Accounts of Gas and Water Companies.

To examine the Books and Accounts, and prepare Balance-Sheets for the information of Directors.

To assist Secretaries in preparing Balance-Sheets, according to the "Gas-Works Clauses Act, 1871;" or may be consulted with respect to Accounts generally.

WM. RICHARDS,

INVENTOR OF THE DRY GAS-METER,
REVISER OF "HUGHES ON GAS-WORKS,"
CONSULTING GAS ENGINEER,

Advises on all matters of business connected with Gas lighting. Furnishes Working Drawings of Retort-Settings, pecification of Works, complete or in detail.

17, BURTON ROAD, BRIXTON, LONDON, S.W.

GAS COMPANIES ACCOUNTS.

EDWARD SANDELL,

PUBLIC ACCOUNTANT,

The Projector of the Gas Companies Analyzed Expenditure Account Book, having had twenty years experience in opening, keeping, auditing, and investigating Gas Companies Accounts, offers his services for similar purposes, and also in preparing Financial and Statistical Accounts for Arbitrations or Parliamentary Applications. References to numerous Gas Companies and the most eminent Consulting Gas Engineers.

4, Skinner's Place, Queen Victoria Street, LONDON.

TO INVENTORS AND PATENTEES.

MR. W. H. BENNETT, having had considerable experience in matters connected with Gas, Water, and Sanitary Improvement, begs to say that he continues to assist Inventors in the perfection of their designs, and to obtain for them PROVISIONAL PROTECTION, whereby their invention may be secured for Six Months; or LETTERS PATENT, which are granted for Fourteen Years.

Patents completed, or proceeded with at any stage, thereby rendering it unnecessary for persons resident in the country to visit London.

Patents procured for Foreign Countries.

Information as to cost, &c., supplied gratuitously upon application to the Advertiser, 42, Parliament Street, WESTMINSTER.

WATER-MAINS.

COTTERILL'S PATENT STEEL TUBE-DRILLS, for connecting services to water-mains, *under pressure*, without turning off the water. They drill and tap themselves, and are left in the mains. Made of all sizes, from ¾ to 2 inches and upwards. They cost less than the ordinary plan.

Apply to CHARLES FORSTER COTTERILL, Cannock, STAFFORD, Patentee.

THOMAS READ & CO.,

BRAZILIAN IRON-WORKS,

MALTON, YORKS,

MANUFACTURERS OF

GAS and WATER PIPES,

Bends, Tees, and Irregulars,
AND
GENERAL FOUNDERS.

ESTIMATES and PRICES on APPLICATION.

PATENT FUEL AND LIME FOR PURIFYING FROM FOUL LIME.

By a simple process the Foul Lime is converted into Fuel, by the combustion of which the lime is reproduced as a purifying agent.

Licences to work the invention will be granted to Gas Companies on very reasonable terms.

For further particulars apply to Mr. E. MADDOCKS, Manager of the Gas-Works, KETTERING.

The adoption of the above invention, without a licence from the Patentee, will be an infringement of the patent, and will subject the person or company guilty of such infringement to legal process.

BIRTLEY IRON WORKS,
CHESTER-LE-STREET,
DURHAM.

Manufactory for every description of Casting and Machinery for Gas-Works and Water-Works.

Warehouse in London for Cast-Iron Pipes and Connexions of all sizes and in any quantity, Scott's Wharf, Bankside, Southwark.

Agent in London, Mr. J. MANWARING, 101 Cannon Street E.C.

OXIDE OF IRON.—
We are prepared to supply, on moderate terms,
HYDRATED PEROXIDE OF IRON (BOG OCHRE),
Same quality as supplied by us to several of the most extensive Gas Companies, and which has given entire satisfaction.

FRANCIS RITCHIE & SONS,
BELFAST.

PRICE'S PATENT COKE & COAL BARROW.

effecting a great saving of time, labour, and expense.

For particulars, price, &c., apply to Mr. E. PRICE, Inventor and Patentee, Gas-Works, Hampton Wick, MIDDLESEX.

CAFFALL, THOMAS, & CO.,
LIMITED,
Patentees and Manufacturers of the
IMPROVED MOVEABLE SEAL FOR DIP-PIPES,
Now used with great success at numerous gas-works throughout the kingdom.

Testimonials and Prices on application.

OFFICES:
28, GRACECHURCH STREET, LONDON, E.C.

BELGIAN CLAY RETORTS.

J. SUGG and CO., late ALBERT KELLER, GHENT.—The removal of the import duties on Earthenware permitting the entry of Clay Retorts into England, Messrs. Sugg, of Ghent, beg to draw the attention of the Gas Companies of London, and other Cities, to the very superior quality of the RETORTS manufactured by them. They can be made of any size, in one piece, and of any form. The price will be in proportion to the weight, and very moderate in comparison to their value.

Communications addressed to J. SUGG & CO., GHENT, will receive immediate attention.

FIRE-CLAY RETORTS.

WILLIAM FRASER,
INVERKEITHING,
Owner of the Works at which Fire-Clay Retorts were first made), can supply
RETORTS, FIRE-BRICKS, &c.,
to any extent.

References can be given to managers of above a hundred Gas-Works whom he supplies.

He ships at Charlestown his
CELEBRATED HALBEATH STEAM COALS,
on Navy List.

JAMES NEWTON & SONS.
(Established 1820,)
FIRE-BRICK AND TILE MERCHANTS,
Wholesale and for Exportation,
FALCON DOCK, 78 AND 79, BANKSIDE,
SOUTHWARK, LONDON, S.E.,
DEPÔT for STOURBRIDGE AND NEWCASTLE FIRE-BRICKS, LUMPS, TILES, and FIRE-CLAY, and every Article suitable for
GAS AND WATER WORKS.

TO GAS COMPANIES, ENGINEERS, &c.
WOOD SIEVES.—WOOD SIEVES.
Estimates given and Contracts taken by the Manufacturer
GEORGE MACKANESS,
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LONDON, N.W.

These Sieves are made with parallel or bevel bar, and guaranteed to be well seasoned yellow deal, and not common spruce so generally used.
N.B.—Specimens sent free on application.

B. CARPENTER,
THE ORIGINAL MANUFACTURER OF
WOOD SIEVES
FOR
GAS PURIFIERS & SCRUBBERS.

WORKS:
22, HERMES STREET, PENTONVILLE ROAD,
LONDON, N.

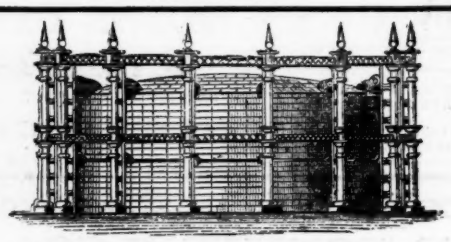
TO GAS COMPANIES AND THE TRADE.
J. DEFRIES & SONS,
MANUFACTURERS OF
CRYSTAL, BRONZED, & ORMOLU CHANDELIERS, IMPROVED CRYSTAL STAR & SUN LIGHTS, VESTIBULE LAMPS, AND THE PATENT CRYSTAL ILLUMINATION.
A LARGE STOCK ALWAYS IN HAND OF
IRON, BRASS, COMPOSITE, AND LEAD TUBES, FOR GAS AND WATER,
AND EVERY DESCRIPTION OF
GAS AND WATER FITTINGS.
THE PATENT DRY AND WET METER, WITH THE LATEST IMPROVEMENTS.
STREET LAMPS AND COLUMNS IN GREAT VARIETY.
WORKS: LONDON AND BIRMINGHAM.

GAS MOONS,
Cut and Engraved, of the newest designs
GAS REFLECTORS
In Silver and Glass
GAS NIBS
AND
BURNERS
Of every description.

Pattern-Books of Gas-Fittings, Crystal and Ormolu Chandeliers for 1873, are now complete.

City Show-Rooms and Manufactory, 147, HOUNDSDITCH, LONDON.
ESTABLISHED 1830.

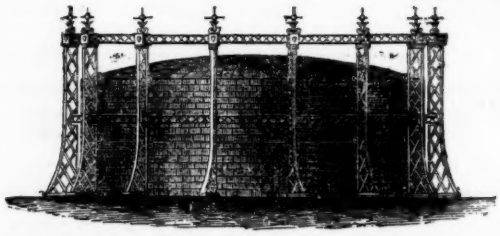
HOPE IRON WORKS,



STOCKTON ON TEES.

ASHMORE & WHILE,
GAS ENGINEERS & CONTRACTORS,
MANUFACTURERS OF GASHOLDERS,
GAS APPARATUS OF EVERY DESCRIPTION,
Including Improved
Retort-Lids, Boilers, Cast and Wrought Iron Tanks, Iron Roofing, Bridges, Girders,
And GENERAL IRONWORK.

N.B.—Estimates for all Gas Plant and Remodelling supplied on application.



THE HORSELEY COMPANY,
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TIPTON, STAFFORDSHIRE.
LONDON OFFICE:
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GAS ENGINEERS, IRONFOUNDERS, &c.,
MANUFACTURERS OF
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AND ALL REQUISITES FOR EITHER
GAS OR WATER WORKS;
ALSO
MAKERS OF ROOFS, BRIDGES, &c.

J. & J. BRADDOCK,

GAS ENGINEERS,

GLOBE METER-WORKS, OLDHAM,

MANUFACTURERS OF

WET & DRY CONSUMERS GAS-METERS

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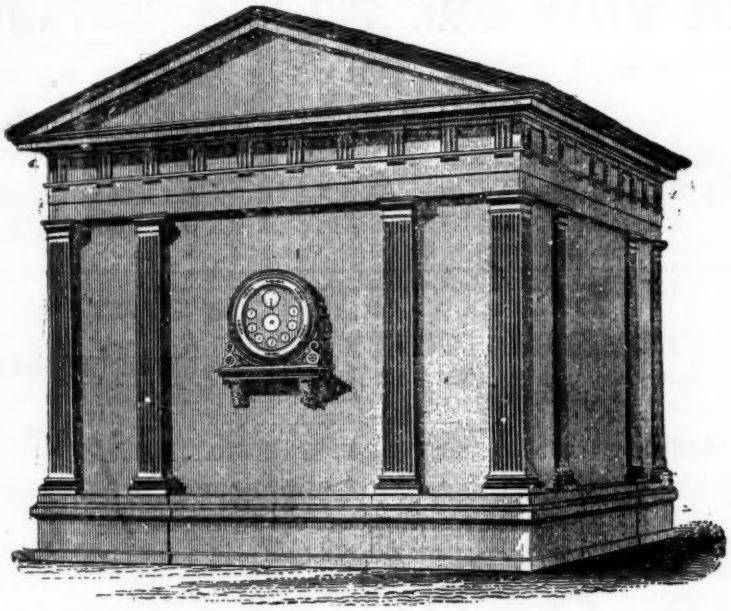
ROUND STATION-METERS,

ON CAST-IRON STANDS.



SQUARE STATION-METERS,

WITH PLANED JOINTS.

GOVERNORS, GAUGES, INDICATORS, MAIN COCKS, &c.

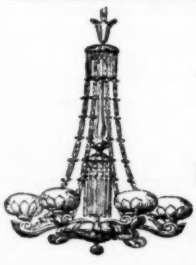
GAS COOKING APPARATUS.

Home and Foreign Orders promptly attended to.

All Sizes of CONSUMERS METERS, STATION-METERS, and GOVERNORS generally in Stock.

Orders almost invariably despatched on the day of receipt.

TERMS, &c., ON APPLICATION.



F. & C. OSLER,

45, OXFORD STREET, LONDON, W.

MANUFACTORY AND SHOW-ROOMS:

BROAD STREET, BIRMINGHAM.

ESTABLISHED 1807.

MANUFACTURERS OF CRYSTAL GLASS CHANDELIERS,

WALL LIGHTS, AND LUSTRES FOR GAS AND CANDLES.

TABLE GLASS OF ALL KINDS.

CHANDELIERS IN BRONZE AND ORMOLU. MODERATOR LAMPS.

GEORGE ANDERSON,

GAS AND CONSULTING ENGINEER,

4, CANNON ROW, PARLIAMENT STREET, S.W.

MR. ANDERSON advises Companies on all matters connected with the manufacture of Gas and the construction of Works.

PATENTEE and MANUFACTURER of the following Inventions:—

RETORT SETTINGS, heated by tar without the production of smoke.

STEAM-ENGINES and EXHAUSTERS, separately or combined.

FOUR-WAY VALVES, one of which is equal to three ordinary Valves.

STATION GOVERNORS—the Gasholder cannot tilt and cause accident.

BREEZE AND TAR FUEL MACHINE.

A Pamphlet containing eighteen Illustrations of the foregoing, with letterpress on the construction of Works, post free, 2s. 6d.

N.B.—The second edition of this Work, *now ready*, contains Illustrations of the Machine for converting Breeze and Tar into Fuel for heating the Retorts.

"The Author is well qualified to speak authoritatively upon the important subjects to which his pamphlet refers."—*Artizan.*

ADDISON POTTER,

WILLINGTON QUAY,

NEAR NEWCASTLE-UPON-TYNE,

Manufacturer of

CLAY RETORTS, FIRE-BRICKS, AND EVERY DESCRIPTION OF FIRE-CLAY GOODS

THOMAS CARR & SON,

MANUFACTURERS OF

FIRE-BRICKS, LUMPS, TILES, RETORTS, &c., &c.,

SCOTSWOOD FIRE-BRICK WORKS,

NEAR

BLAYDON-ON-TYNE.

EMILY GIBBONS,

Dibdale Fire-Clay Works & Colliery,

Near STOURBRIDGE.

(ESTABLISHED 1834.)

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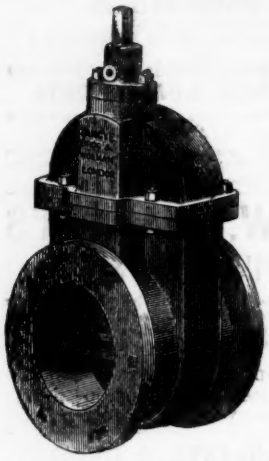

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Of superior quality, delivered at any station in England and Wales.

Purified gas per ton of coal in cubic feet (average)	10,775
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Analysis by F. J. EVANS, Esq., Chartered Gas Company, Horseferry Road, Westminster:—

(COPY.)

	Cubic Feet of Gas per Ton of Coal.	Illuminating Power in Candles.	Coke per Ton of Coal used.	Ash in Coke, per Cent.	Sulphur in Coal, per Cent.
Silkstone Nuts . . .	10·800	15·85	12·66 cwt.....	6·0	0·69

NOTE.—The illuminating power of the gas was tested by the standard burner now used in London by the Gas Referees, under the City of London Gas Act, 1868.

Horseferry Road, Westminster, March, 1870. (Signed) F. J. EVANS.

These Nuts are extensively used by various Gas Companies throughout the Kingdom, who bear strong testimony to their value.

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Yields 12,160 cubic feet of 32·5-candle gas per ton, and 10 cwts. of excellent coke, containing only 5 per cent. of ash.

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Yields 10,700 cubic feet of 32·77-candle gas per ton, and 9½ cwts. of coke, containing 11 per cent. of ash.

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Yields 13,320 cubic feet of 32·5-candle gas per ton.
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Of every description delivered f.o.b. United Kingdom, or cost freight and insurance Abroad, upon lowest terms.
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POPE & PEARSON'S GAS COAL.—We have now the authority of several of the most eminent Gas Engineers of London in stating that our Coal yields *in practical working over* 10,000 *cubic feet of gas, with an illuminating power of* 16 *candles;* or by the standard burners now used by the London Gas Companies, an illuminating power equal to 17½ candles.
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COPPA COLLIERY, MOLD,
Beg leave to call the attention of Gas Companies to the superior quality of their
CANNEL FOR GAS-MAKING PURPOSES.
This Cannel produces in actual working, in iron retorts, 9200 cubic feet of 32-candle gas, and upwards of 11 cwt. of coke, and in clay retorts will produce 11,500 cubic feet of 25·9-candle gas.
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This Company request attention to the very superior quality of their Cannel Coals.

1. The following are the practical results given by Dr. Wallace, of Glasgow, of analyses of their Lochore and Capledrae Cannels:—

	Sample worked at Capledrae.	Sample worked at Lochore.
Gas per ton of coal, at 60° Fahr. and 30 inches barometric pressure	13,095 cubic feet.	11,760 cubic feet.
Illuminating power, in standard sperm candles, by union jet consuming 5 cubic feet per hour, at ·5-inch pressure	32·91	34·83
Value of 1 cubic foot of gas in grains of sperm	780	836
Equivalent of a ton of coal in pounds of sperm candles	1,459	1,404
Durability of 1 cubic foot by 5-inch flame	69 minutes.	71 minutes.
Gravity of the gas (air = 1000)	596	594

Remarks.—This (the sample from Capledrae) is a Cannel Coal of first-class quality, giving 13,000 feet of 33-candle gas. It contains only a minute proportion of sulphur, and the ash is almost quite white. The coke is of rather inferior quality.

Remarks on Sample from Lochore.—This is a Cannel Coal of first-class quality, giving a large yield of very rich gas and a coke of medium quality.

2. The following are the practical results of analyses by Dr. Wallace of the Company's Waverley Cannels:—

	Capledrae Waverley.	Lochore Waverley.
Gas per ton of coal, at 60° Fahr. and 30 inches barometer	9,120 cubic feet.	11,145 cubic feet.
Illuminating power, in standard candles, by union jet consuming 5 cubic feet per hour, at ·5-inch pressure	36·62	33·09
Value of 1 cubic foot of gas in grains of sperm	878	794
Equivalent of a ton of coal in pounds of sperm candles	1,145	1,264
Durability of 1 cubic foot of gas by 5-inch flame	80 minutes.	67 minutes.
Gravity of the gas (air = 1000)	677	597

Remarks on the Sample of Capledrae Waverley.—This Coal gives fully 9000 feet of gas of 36½ candles, and is admirably adapted for bringing up the quality of gas made from common coal or inferior qualities of cannel. The tests were made at a rather high temperature, this being one of the coals that stand a very high heat without serious diminution of the illuminating power of the gas The coke contains 60 per cent. of ash, and is therefore almost valueless, but the proportion of sulphur is very moderate.

Remarks on the Lochore Waverley.—This is a first-class Cannel Coal, giving 11,000 cubic feet of 33-candle gas. The quantity of sulphur is very minute, and the ash is nearly white. The coke is of inferior quality, but not wholly valueless.

Applications for full Copies of Analyses and Prices may be made to the Company, at

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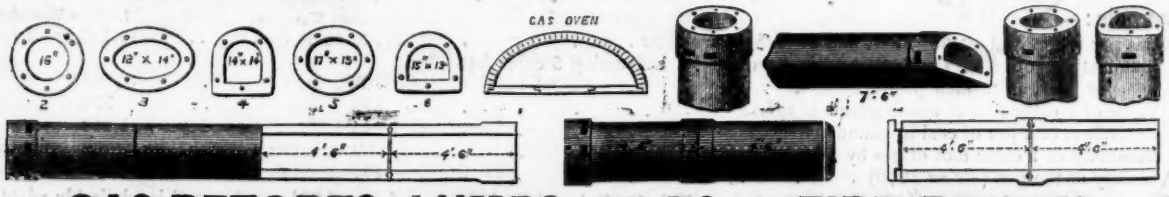

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